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REVIEW
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PEACE (T. R.). **Experiments on spraying with DDT to prevent the feeding of Scolytus Beetles on Elm and consequent infection with Ceratostomella ulmi.**—*Ann. appl. Biol.*, 41, 1, pp. 155–164, 1954.

In three years' work by the Forestry Commission Research Station, Alice Holt, Farnham, Surrey, street elms in Folkestone [Kent] and Aldenham [Hertfordshire] were sprayed twice during the growing season with insecticides to prevent infestation by *Scolytus scolytus* and *S. multistriatus*, and consequent infection by *Ceratostomella ulmi* [*R.A.M.*, 28, p. 652; 33, p. 390]. A 1·5 per cent. spray of DDT in miscible oil gave reasonably good control of infection, and was greatly superior in this respect to solutions made from DDT dispersable powder.

The cost of spraying trees 20 to 30 ft. high amounted to over £1 per tree per year, which is regarded as prohibitive in most cases. Unless chemotherapy, which costs about the same as spraying, can be cheapened, control must continue to be based on general sanitation to reduce the population of infective beetles, and the breeding or selection of resistant elms [see next abstract].

WENT (JOHANNA C.). **The Dutch Elm disease. Summary of fifteen years' hybridisation and selection work (1937–1952).**—*Tijdschr. PlZiekt.*, 60, 2, pp. 109–127, 1 fig., 1954. [Dutch summary.]

This comprehensive, tabulated survey incorporates the results, already presented from time to time [*R.A.M.*, 31, p. 637], of 15 years' work on hybridization and selection for the control of Dutch elm disease (*Ophiostoma* [*Ceratostomella*] *ulmi* [see preceding abstract]) in Holland. Two highly resistant types have already been found and there are grounds for hope that a combination of high resistance to infection with an attractive growth habit may be achieved within the next few years.

SABET (K. A.). **Studies in the bacterial die-back and canker disease of Poplar. II. The relation between the bacterial slime and the causal organism.**—*Proc. Soc. appl. Bact.*, 16, 1, pp. 45–55, 1 fig., 1953.

Most of the results described in this further account of the author's studies on bacterial die-back and canker of poplar (*Pseudomonas syringae* f.sp. *populea*) [*R.A.M.*, 32, p. 522 and next abstract] have already been noticed from another source [32, p. 44].

The bacterial slime provides the pathogen with several advantages which no artificial solution can supply and which appear to facilitate infection and enable the bacterium to establish itself in the host tissues before late summer, when the disease ceases to progress. The production of slime starts with the accumulation during spring of nitrogenous compounds in tissues with perennial cankers and cracks. The amides in particular constitute a very favourable nutritional base for

the production and activation of pectic enzymes by overwintering bacteria. The bacteria multiply rapidly and produce slime from the decomposition products of pectic substances. The slime contains small quantities of nitrogenous compounds probably derived from the cell sap of disintegrated host tissues. The toxins and pectic enzymes are introduced into the slime as a consequence of the activities of the pathogen.

SABET (K. A.). **Studies on the bacterial die-back and canker disease of Poplar. III. Freezing in relation to the disease.**—*Ann. appl. Biol.*, 40, 4, pp. 645–650, 1 fig., 1953.

In further studies at the Botany School, Cambridge, on bacterial die-back and canker of poplar [*Pseudomonas syringae* f.sp. *populea*: see preceding abstract] an investigation was made of the effect of artificial freezing on infection and on the progress of the disease, a brief note on which has already appeared [*R.A.M.*, 32, p. 44]. Potted cuttings of *Populus serotina*, *P. eugenei*, and *P. trichocarpa* kept in a greenhouse where the temperature never fell below freezing-point were placed in a freezing chamber for one, two, three, or six periods of six hours from March to May, 1949 and 1950, and then returned to the greenhouse.

The results obtained demonstrated that artificial freezing [? of uninfected cuttings] after dormancy had ended produced serious leaf necrosis and twig die-back; branches were either killed outright or developed only slight internal damage. No cracks or cankers developed on living branches. Freezing increased the damage caused by well-established infection, though it checked new lesions. Freezing before infection had no appreciable effect on the establishment of the disease.

It is concluded that frost may aggravate the disease in its post-infection stages, as do other environmental factors, such as rain and high relative humidity.

TRUE (R. P.), TRYON (E. H.), & KING (J. F.). **Cankers and decay of living Yellow Birch caused by Poria laevigata (Fr.) Cooke in the Monogahela National Forest.**—Abs. in *Phytopathology*, 43, 9, p. 487, 1953.

In the Monogahela National Forest, United States, the dissection of eight felled yellow birches averaging 22 in. in diameter at breast height revealed a white rot consisting of alternate concentric or intersecting, broad or narrow zones of white and pale reddish-brown wood. It was usually confined to the heartwood but sometimes the sapwood also was involved. The decay extended throughout the merchantable length of the trees, five of which showed no external symptoms except bark-covered cankers, the lowest of which were 9 to 24 ft. (average 13 ft.) above ground. Dead branches of two trees bore sporophores of *Poria laevigata* [*R.A.M.*, 22, p. 158; 31, p. 359], but none was associated with cankers on living trees. At least two cankers showed the typical hard, chequered surfaces described by Campbell and Davidson [18, p. 145]. Isolations from cankered trees consistently yielded *P. laevigata*.

PACLT (J.). **Synopsis of the genus Catalpa (Bignoniaceae) Part VII (addenda 2).**—*Phytopath. Z.*, 21, 3, pp. 329–332, 4 figs., 1954. [German summary.]

In this further contribution to the pathology of *Catalpa bignonioides* [*R.A.M.*, 31, p. 153] in the vicinity of Bratislava, Czechoslovakia, trees are reported to have been affected recently by a die-back associated with invasion by *Tubercularia confluens*, probably through apical injuries. The pinkish, hemispherical sporodochia develop on the necrotic bark of the twigs and branches, while the greyish, discoloured wood may decay in places, possibly under the influence of *Schizophyllum commune*, which was detected on several trees. The sapwood vessels and parenchymatous tissues of the pith contain hyphae of *T. confluens*. The fungus is transmissible by mites of the group *Detriticolae*. Another species of fungus occurring on

the dead bark was identified by Dr. E. Müller, of the Federal Technical Institute, Zürich, as *Diplodia mutila* [26, p. 143], a new record for *Catalpa*.

NORDIN (V. J.). **Studies in forest pathology. XIII. Decay in Sugar Maple in the Ottawa–Huron and Algoma Extension Forest region of Ontario.**—*Canad. J. Bot.*, 32, 1, pp. 221–258, 17 pl., 8 graphs, 1 map, 1954.

Decay causes considerable losses in sound wood volume of sugar maple (*Acer saccharum*) in the Ottawa–Huron and Algoma Extension Forest region of Ontario [*R.A.M.*, 32, p. 289]. Of 606 sample trees examined in a further study in this series [see next abstract], 74 per cent. had some measure of decay. There were 28 fungi involved, the most important being *Armillaria mellea* (266·5 cu. ft. decay), *Polyporus glomeratus* [31, p. 524] (253·1), *Ustulina vulgaris* [*U. deusta*] (143), *Fomes connatus* (87·3), *Hydnum septentrionale* (77·4), *Corticium vellereum* [33, p. 268] (65·2), *Pholiota spectabilis* (49·5), and *Fomes igniarius* (36·7). *P. spectabilis* and *Hericium* [*Hydnum*] *laciniatum* (0·2) are newly recorded on living sugar maple. *A. mellea* was the most serious agent of butt decay. *Polyporus glomeratus* was the most important trunk-rotting species, accounting for 36 per cent. of the infections and 40 per cent. of the cubic volume of trunk decay. The average extent of decay in living trees was estimated according to the occurrence of sporophores of *F. connatus*, *F. igniarius*, *H. septentrionale*, and *U. deusta*. More than 65 per cent. of the sample trees 41 to 80 years old contained some decay, the incidence and volume increasing progressively with age and diameter. Frost cracks constituted the primary place of entry for the fungi, next in importance being dead branches and branch stubs.

Various discolorations, some associated with fungi, also constitute an important de-grading factor in sugar maple timber.

It is concluded that cultural studies are a prerequisite to the adequate appreciation of the significance of decay fungi, to the elucidation of irregularities in the results of decay investigations to the provision of information valuable in the estimation of cull in standing trees, and to the correct understanding of the nature and spread of decay fungi.

FOSTER (R. E.), CRAIG (H. M.), & WALLIS (G. W.). **Studies in forest pathology. XII. Decay of Western Hemlock in the Upper Columbia region, British Columbia.**—*Canad. J. Bot.*, 32, 1, pp. 145–171, 2 pl., 5 graphs, 1 map, 1954.

In a further study in this series [cf. *R.A.M.*, 33, p. 389 and preceding abstract] an analysis of 833 western hemlock (*Tsuga heterophylla*) logs on 36 sample plots of mature timber in the Upper Columbia region of British Columbia [33, p. 647] yielded 26 decay fungi, of which *Echinodontium tinctorium* and *Fomes pini* [32, p. 521] accounted for 62 and 25 per cent. of the decay, respectively. The fungi responsible, however, varied considerably in each region studied. *E. tinctorium* decreased and *F. pini* increased with increasing site quality, relatively to the total incidence and importance of decay. Sporophores, scars, dead tops, large rotten branches, swollen knots, frost cracks, forked trees, and mistletoe infections on the trunks were reliable indicators of hidden defects. Living trees, classed as suspect or residual according to the presence or absence of one or more of these indicators, were found to differ appreciably in average defect. Within each diameter class, decay increased progressively with increasing girth and decreasing site quality. Immature hemlock was susceptible to considerable decay while mature stands reached an advanced stage of deterioration at 250 years. Multiple correlation analyses between percentage decay, site, age, and the relative percentage of residual trees weighted by volume permitted an estimate of total stand defect within ± 7 per cent.

It is estimated that many of the affected logs could be utilized for pulp, particularly those decayed by *F. pini*. It is suggested that existing mature and

overmature forests should be utilized immediately, and the site clear-cut or burned before being replaced by younger and more vigorous stands.

FULLER (C. E. K.) & NEWHOOK (F. J.). **A report on Cypress canker in New Zealand.** —*N.Z. J. Agric.*, 88, 3, pp. 211, 213, 215, 217, 219–220, 9 figs., 1 graph, 1954.

Cypress canker (*Monochaetia unicornis*) is reported to be causing serious damage to Lawson's cypress (*Chamaecyparis lawsoniana*) and *Cupressus macrocarpa* in New Zealand [*R.A.M.*, 33, p. 329], affecting 90 per cent. of established shelter belts of these species in the Waikato district and to a lesser extent in other districts. In the Hamilton district 11 nurseries have been attacked, and some of the highly susceptible ornamental varieties showed 80 per cent. infection. Control measures in the nursery include a thorough examination of stock trees intended for cutting material, growing cypress species well away from any affected hedgerows, reducing damage to plants during cultivation, thorough spraying with Bordeaux mixture, and removal of any suspected trees.

Young hedgerow plantings should be sprayed regularly once in the autumn and again early in the spring with Bordeaux mixture, and cankered parts removed and burnt. Similar treatment is recommended for specimen trees, but here individual cankers should be removed by tree surgery. There is no practical curative measure for established mature hedges and the only means of obtaining a healthy shelter belt is to replace the diseased trees with resistant varieties and species, an annotated list of which is given. Other species shown to be susceptible include *Chamaecyparis thyoides* var. *andelyensis*.

TORGESON (D. C.). **Root rot of Lawson Cypress and other ornamentals caused by Phytophthora cinnamomi.**—*Contr. Boyce Thompson Inst.*, 17, 6, pp. 359–373, 3 figs., 1954.

The tree root rot in Oregon caused by *Phytophthora cinnamomi* [*R.A.M.*, 31, p. 152; cf. 33, p. 508] has also been found attacking *Chamaecyparis lawsoniana* vars. *allumi* and *elwoodi* [32, p. 521], English yew (*Taxus baccata*), Japanese yew (*T. cuspidata*), *Erica carnea*, and *Calluna vulgaris* vars. *alba* and *aurea* in both nurseries and home plantings. Twenty-five out of 47 plant species or varieties tested, including the above, were susceptible to an isolate of *P. cinnamomi*. Among 14 isolates four physiologic strains were differentiated on *Chamaecyparis lawsoniana* var. *allumi*, English walnut (*Juglans regia*), Irish yew (*T. b.* var. *fastigiata*), and Douglas fir (*Pseudotsuga taxifolia*).

Soil of a moderate texture with a high moisture-level appears to favour the development and spread of root rot. Infection by both *Phytophthora cinnamomi* and *P. lateralis* [loc. cit.] probably occurs in late spring or early summer when the soil is warm enough for zoospore production. *P. cinnamomi* may penetrate to a depth of at least 2·4 ft., precluding eradication by soil fumigation.

The ease with which the pathogen is disseminated, its wide host range [33, p. 439], and the lack of any practical means of control may result in *P. cinnamomi* becoming serious in Oregon.

VAN ARSDEL (E. P.), RIKER (A. J.), & PATTON (R. F.). **Microclimatic distribution of White Pine blister rust in southwestern Wisconsin.**—Abs. in *Phytopathology*, 43, 9, pp. 487–488, 1953.

Constant temperature studies of spore germination of *Cronartium ribicola in vitro* and *in vivo* were carried out to determine the reason for the localization of blister rust on eastern white pine [*Pinus strobus*: *R.A.M.*, 33, p. 455] in southern Wisconsin contrasted with its widespread distribution in the north of the State wherever *Ribes* spp. [loc. cit.] were present. The aecidiospores germinated over a range from 8° to 24° C., with an optimum at 16° to 20° [cf. 32, p. 526], and the

uredospores from 12° to 28° (20°). Teleutospores produced on *Ribes* at 16° gave rise to sporidia between 4° and 20°, while those formed at 20° and 24° were erratic in sporidial production or virtually sterile. Hygrothermographs showed that in the epidemic years of 1944 and 1947 locations where rust infection was intense not only averaged less than 20° but sustained a saturated atmosphere for several hours longer every day than in the surrounding area during the late summer and autumn.

RIBALDI (M.). **Necrosi corticale e alterazione cromatica del legno prodotte sul Pino austriaco da Phomatosphaeropsis pinicola n.gen. et n.sp.** [Bark necrosis and colour change of the wood produced in Austrian Pine by *Phomatosphaeropsis pinicola* n.gen., n.sp.]—*Ann. Sper. agr.*, N.S., 7, 3, pp. 837–851, 5 pl., 4 figs., 1953. [English summary.]

In further work on the disease of Austrian pines (*Pinus nigra* var. *austriaca*) near Turin, Italy [*R.A.M.*, 33, p. 647], the fungus isolated from infected tissues caused infection of *Cedrus libanotica* [*C. libanensis*] in wound inoculations. The fungus produces large, chestnut brown, oblong-cylindrical, continuous or rarely 1- to 3-septate macroconidia measuring 16 to 48 (mostly 30 to 35) by 10 to 17 (mostly 12 to 14) μ, in pycnidia immersed in a brown or black stroma, and in the same pycnidia small, oblong, straight or sometimes somewhat allantoid, continuous, hyaline microconidia measuring 2 to 7 by 1 to 2 (mostly 5·5 by 1·5) μ. As no genus of the Sphaerioidaceae is known to possess these two types of conidia, the author considers the fungus to belong to a new genus and names it *Phomatosphaeropsis pinicola* n.sp.

Occasionally present in the bark and outer part of the sapwood of severely affected trees was *Pezicula livida* [18, p. 762; 29, p. 536].

DAVIDSON (R. W.) & CAMPBELL (W. A.). **Poria cocos, a widely distributed wood-rotting fungus.**—*Mycologia*, 46, 2, pp. 234–237, 1 fig., 1954.

The sclerotia or tuckahoes of *Poria cocos* [*R.A.M.*, 8, p. 813; 28, p. 596, *et passim*], found in a number of places in the southern and eastern United States, are usually associated with tree roots, and on occasion have been collected in quantities during the clearing or ploughing of forest land.

Observations on the decay of pines killed by 'little leaf' [associated with *Phytophthora cinnamomi*: 31, p. 360] showed that many soon became affected by a brown, cubical butt rot caused by *Poria cocos*, which usually caused the trees to break near the ground a few years after death. The proportion of dead trees with this type of rot varied with the locality.

During routine decay isolation studies *P. cocos* was isolated from a variety of hosts from most of the important timber areas of the United States. A list of new hosts is given.

STONE (E. L.), MORROW (R. R.), & WELCH (D. S.). **A malady of Red Pine on poorly drained sites.**—*J. For.*, 52, 2, pp. 104–114, 7 figs., 1 diag., 4 graphs, 3 maps, 1954.

Stunting and death of five- to 40-year-old red pines (*Pinus resinosa*) in southern New York State are consistently associated with impeded soil drainage and are probably caused by root injury resulting from deficient soil aeration, particularly during prolonged spring rains. The disorder is characterized by three different symptom manifestations. Condition (*a*), the most conspicuous, is usually observed in 15- to 40-year-old plantations, where good initial growth is followed by progressive stunting and rapid death of most of the trees and reduced growth of the needle-bearing twigs, resulting in a characteristic tufted appearance in the later stages. In (*b*) poor to fair growth is followed by the death of single or small groups of trees, while in (*c*) prolonged and severe stunting is accompanied by the gradual

death of individual trees; both conditions affect wider and more numerous areas than (*a*).

The only practical method of avoiding root injury appears to be by proper selection of planting sites. A table grouping some common soil series of Alleghany county, New York, according to their suitability for red pine is given.

ROHMEDER (E.). **23 jährige bayerische Anbauversuche mit grüner Douglasie verschiedener Herkunft.** [Bavarian planting experiments during 23 years with green Douglas Fir from various sources.]—*Forst u. Holz*, 9, 9, pp. 179–180, 1954.

From 1934 to 1951 Douglas fir [*Pseudotsuga taxifolia*] seedlings from Washington, Oregon, California, and Mexico were planted in 12 Bavarian forest districts situated at altitudes of 300 to 600 m. The best growth, both as regards timber production and resistance to *Phaeocryptopus gaeumanni* [*R.A.M.*, 32, p. 409], was secured with the material from a site at an elevation of 100 to 300 m. on the western slope of the Cascade Mountains, Washington.

FRANCKE-GROSMANN (H[ELENE]). **Feinde und Krankheiten der Sitkafichte auf norddeutschen Standorten.** [Pests and diseases of Sitka Spruce in north German habitats.]—*Forst u. Holz*, 9, 6, pp. 117–119, 1954.

Joint infection of Sitka spruce in north German forests by the giant bark beetle *Dendroctonus micans* and *Fomes annosus* [*R.A.M.*, 29, p. 67] has been observed during the past 15 years, mostly on 40-year-old trees on reclaimed waste ground and arable land. In general, this species of spruce is relatively resistant to *Armillaria mellea* [31, p. 534], which may, however, prove destructive in association with insect pests, such as *Gilletteella cooleyi* and *Liosomaphis abietina*. *Sparassis ramosa* and *Polyporus schweinitzii* [C.M.I. map No. 182] cause a brown butt rot of 70-year-old trees, the heartwood disintegrating into fragments with a smell of turpentine.

GOTHE (H.). **Beobachtungen über Stockfäule in Schlitzer Lärchenbeständen.** [Observations on butt rot in Larch stands at Schlitz.]—*Forst u. Holz*, 9, 1, pp. 11–13, 1954.

Of 1,650 felled 51- to 150-year-old larches examined within a single forest district during the period from 1949 to 1952 at Schlitz, Germany, 186 (11·3 per cent.) were infected by the butt rot due to *Trametes radiciperda* [*Fomes annosus*: cf. *R.A.M.*, 31, p. 262; 33, p. 190] or more rarely to *Polyporus schweinitzii* [cf. preceding abstract]. The disease was more prevalent in the 130- to 150-year age group (40·3 per cent.) than in younger trees (9·9), but no connexion was traceable between the incidence of infection and the type of stand (pure or mixed).

MANNERS (J. G.). **Studies on Larch canker I. The taxonomy and biology of Trichoscyphella willkommii (Hart.) Nannf. and related species.**—*Trans. Brit. mycol. Soc.*, 36, 4, pp. 362–374, 1 pl., 6 figs., 1953.

In this discussion of the taxonomy of the larch canker fungus and related species *Trichoscyphella willkommii* is accepted for the former [*R.A.M.*, 33, p. 391] and *T. hahniana* n.comb. (syn. *Lachnella hahniana*) [31, p. 461; 32, p. 407] is proposed for the related saprophyte generally known as *Dasyscypha calycina*. These species are shown to differ morphologically and pathologically and detailed descriptions are given of each. *T. willkommii* has a longer ascus and no sub-moniliform paraphyses, while in the field the thick exciple and pale disk are distinctive.

In August, 1950, 48 young European larches (*Larix europea*) on the Trewidden Estate, near Penzance, Cornwall, where frost occurs very rarely, were wound-inoculated with single-ascospore cultures of the above species [32, p. 107] and with

Erinella pommeranica, which is often associated with canker of Scots pine in the New Forest [Hampshire]. Only *T. willkommii* was capable of causing canker and die-back under the experimental conditions. Further inoculations in April, 1951, indicated that Scottish strains of *L. europea* may be rather less susceptible than Alpine strains; of 32 larches inoculated with *T. willkommii* 24 became infected; two out of 24 became infected with *T. hahniana*, the strain giving these positive results being one with intermediate characters.

In *Trans. Brit. mycol. Soc.*, 37, 1, p. 21, 1954, the author states that the correct figures for the ascospore measurements of *T. willkommii* should be 127 to 180 by 9 to 12 (mostly 135 to 165 by 9·5 to 11) μ, the figures in the above paper having been given in error.

Němec (A.). **Příspěvek k otázce odumírání Smrku v rudohoří se zvláštním zřetelem ke kouřovým škodám.** [Contribution to the problem of Spruce mortality in the ore-mountains with special regard to smoke injury.]—*Práce výzk. Ust. lesn. Praha* [*Stud. For. Res. Inst., Prague*], 1, 5, pp. 167–227, 8 figs., 10 graphs, 1952. [Russian and English summaries.]

Growth injuries to spruce stands in the ore-mountain regions on the northern and north-western borders of Bohemia, Czechoslovakia, have been recorded since the end of the last century. Remarkable weakening and decline, characterized by reddening, yellowing, and browning of the needles, which finally drop, starting from the lower part of the crown, the tops usually remaining green, were observed in the spring of 1947, particularly in the forests of Mikulovice and Mariánské údolí where these studies were carried out.

Soil examination revealed extreme nutritional deficiencies, especially of lime and potassium, the former causing considerable reduction in needle growth (one third of the normal). In addition, there were high aluminium and sulphur contents in the needles. Sulphur dioxide pollution (ranging from 1 in 405,000 to 1 in 191,000 vol. of air) in industrial and coal mining areas is considered to be directly responsible for most of the symptoms and the ultimate death of the trees [cf. *R.A.M.*, 33, p. 548 and next abstract].

Zieger (E.). **Rauchschäden im Walde.** [Smoke damage in the forest.]—*Wiss. Z. tech. Hochsch. Dresden*, 3, 2, pp. 271–280, 1953–4.

The problem of damage from factory fumes in German forests [*R.A.M.*, 32, p. 411] is discussed in the light of 22 contributions to the literature under the headings of historical development, causes, nature and extent, protective measures, compensation, and prevention.

Christensen (C. M.) & Hodson (A. C.). **Artificially induced senescence of forest trees.**—*J. For.*, 52, 2, pp. 126–129, 1954.

In preliminary trials in Minnesota, artificial senescence was induced in forest trees of a number of species by fastening a galvanized iron band round the trunk, and, while the constriction caused weakening and death, invasion of the trees by fungi and insects was recorded. *Armillaria mellea* [*R.A.M.*, 33, p. 59] invaded most of the dying trees of all the species, but did not appear to injure unbanded ones in the same area, indicating that the presence of the fungus in the roots or lower trunk of dying trees does not necessarily mean that it is the primary cause of death. Similarly, on aspen (*Populus tremuloides*) *Cytospora chrysosperma* [*Valsa sordida*] and *C. nivea* were secondary invaders of dead bark [cf. 19, p. 623; 33, p. 389]. Observations over a period of seven years on artificially damaged trees yielded no evidence that root or butt rot fungi enter primarily or even occasionally through wounded roots.

HUBERT (E. E.). **Isolation of fungi in the field using the Swedish increment hammer.** —*J. For.*, 52, 2, p. 131, 1 fig., 1954.

A description is given of a rapid field method for isolating fungi from the lower trunks and roots of forest trees, samples being taken with a Swedish increment hammer (distributed by Sandvik Saw and Tool Corp., New York) designed to cut a $\frac{1}{8}$ in. core from the bark. The cutting point of the hammer is driven deep through the bark and into the sapwood, loosened by turning, and removed. A plunger on the hammer presses the core out of the cutting head on to an agar slant. *Armillaria mellea* [see preceding abstract], *Leptographium* spp., and other fungi from the bark and outer sapwood have been isolated by this method without contamination.

ENKVIST (T.), SOLIN (EVA), & MAUNULA (U.). **Studies on Pine wood decayed by brown rot.**—*Paperi ja Puu*, 36, 3, pp. 65–68, 1 graph, 1954.

At the University of Helsingfors, Finland, Scots pine (*Pinus sylvestris*) wood decayed by [unspecified] brown rot fungi was readily decomposed in both acid and alkaline sulphite solutions, yielding lignosulphonic acids with high sulphur contents but no tanning properties. Carboxyl groups appear to be abundant in the lignin of rotted wood.

AOSHIMA (K.). **Decay of Beech wood by the haploid and diploid mycelia of Elfvingia applanata.**—*Phytopathology*, 44, 5, pp. 260–265, 1 fig., 5 graphs, 1954.

At the Government Forest Experiment Station, Meguro, Tokyo, Japan, eight diploid mycelia, each isolated from a different sporophore of *Elfvingia applanata* [*Ganoderma applanatum*: *R.A.M.*, 33, p. 390], varied in their capacity to cause decay of beech (*Fagus crenata*) wood blocks. Diploid mycelia derived from pairing mycelia from single basidiospores from the same source likewise differed in pathogenicity, apparently as a result of natural fluctuation. Diploid mycelia from two monosporous mycelia isolated from the fruit body of a mycelium with a strong rotting tendency caused comparable decay, while those derived from crossing a monosporous mycelium derived from a highly pathogenic sporophore with a weakly pathogenic one were intermediate in their action. No significant difference of ability to cause decay existed between the two sexual types of diploid mycelia provided all the haploid mycelia originated in the same fruit body.

RICHARDS (D. B.). **Physical changes in decaying wood.**—*J. For.*, 52, 4, pp. 260–265, 4 graphs, 1954.

Kiln-dried sapwood samples ($\frac{1}{2}$ by $\frac{1}{2}$ by 6 in.) of red gum (*Liquidambar styraciflua*) were subjected at Alabama Agricultural Experiment Station, Auburn, to decay by pure cultures of *Polyporus* [*Polystictus*] *versicolor* and *Lenzites trabea* [*R.A.M.*, 33, pp. 695, 697], and loblolly pine (*Pinus taeda*) by *Polyporus* [*Polystictus*] *abietinus* and *Poria monticola* [32, p. 520] for various periods up to 14 days, after which the loss of toughness, shrinkage, and per cent. weight-loss were evaluated as possible laboratory criteria of decay.

No changes in volume of the test pieces were induced by *Polystictus versicolor* or *P. abietinus*. *Poria monticola* alone reduced the wet volume of the wood significantly, while *L. trabea* caused some shrinkage, detectable only upon drying. The specific gravity of pine decreased with advancing decay from 0·48 to 0·43 (*Polystictus abietinus*) and 0·39 (*Poria monticola*) and of red gum from 0·43 to 0·35 (*L. trabea*) and 0·34 (*Polystictus versicolor*).

Greater loss of toughness occurred in the pine samples than in red gum, but in both species it was reduced very rapidly during the early stages of decay by all

four fungi. The moisture content increased with advancing decay from nil to 47 (*Poria monticola*), 32 (*Polystictus abietinus*), 106 (*L. trabea*), and 60 (*P. versicolor*) per cent.

Change in toughness appears to be the most sensitive measure of decay.

ROFF (J. W.) & ATKINSON (J. M.). **Toxicity tests of a water-soluble phenolic fraction (thujaplicin-free) of Western Red Cedar.**—*Canad. J. Bot.*, 32, 1, pp. 308–309, 1954.

In a study of the extractives of *Thuja plicata* heartwood at the Vancouver Laboratory, Forestry Branch, a water-soluble, non-volatile, polyphenolic fraction, from which the thujaplicins had been removed [cf. *R.A.M.*, 30, p. 6], was found to be fungistatic at 2 per cent. to *Poria monticola* cultures.

MARSDEN (D. H.). **Studies of the creosote fungus, Hormodendrum resinae.**—*Mycologia*, 46, 2, pp. 161–183, 4 figs., 3 graphs, 1954.

Studies at the Shade Tree Laboratories, University of Massachusetts, Amherst, on the biology of five strains of *Hormodendrum resinae* [*R.A.M.*, 22, p. 4], commonly found in wood impregnated with creosote or coal tar, showed that the fungus readily utilized glucose and lignin, but not sucrose, raffinose, d-mannitol, cellulose, bituminous coal, or petroleum as the sole carbon source. Similarly, ammonium sulphate, ammonium nitrate, and peptone were readily utilized, but not sodium nitrite, sodium nitrate, or urea. Increasing concentrations of carbon in the medium were correlated with radial growth and sporulation, and increasing concentrations of nitrogen with sporulation but not with radial growth. Coal tar and creosote could serve as the sole carbon or nitrogen source. With coal tar as the sole nitrogen source, sporulation was directly proportional to the concentration of coal tar in the medium. The mould was inhibited to the same relative degree as wood-rotting basidiomycetes by certain distillation fractions of creosote, and only certain hydrocarbons were tolerated more readily by *H. resinae* than by other moulds.

The results of an *in vitro* experiment to determine how far the toxicity of creosote might be affected by the mould, showed that after 21 days the average colony diameter of the wood-rotting basidiomycete Madison 517 [29, p. 592] on nutrient agar containing creosote in which *H. resinae* had grown for 100 days was 28 mm. as against 20 mm. in fresh creosote agar. This result indicates that the mould may adversely affect the toxicity of creosote.

ASCORBE (F. J.). **The inhibitory action of organic chemicals on a blue stain fungus.**—*Caribbean For.*, 14, 3–4, pp. 136–139, 1953.

In laboratory experiments at the Agricultural Experiment Station, University of Puerto Rico, a number of organic chemicals were tested for their inhibitory action on the wood staining fungus *Trichosporium* sp. [cf. *R.A.M.*, 33, p. 82] grown in nutrient solution. Under the conditions of the experiments pinosylvin [cf. 29, pp. 448, 524], its monomethyl ether, and dihydro pinosylvin (monomethyl ether), all at 100 and 200 γ per ml., gave mycelium weights (in mg.) after nine to ten days of 1·1 and 1·6, 2·4 and 1·2, and 3·7 and 3·8, respectively, compared with 80·4 mg. for the control (medium alone). The figures for phenanthraquinone were 1·8 and 5·1 mg., respectively. The best inhibitors of spore germination and germ-tube growth were: dinitro-*o*-cyclohexyl phenol allowing mycelial weights (in mg.) of 3 and 24·1 at 100 and 200 γ per ml., respectively; DNC 4·2 and 3·7; chloranil cyclopentadiene 40 and 1·6; *p*-chlorometaxylenol 0·8 and 0·9; dibenzoyl ethylene 1·1 and 1; phenanthrene quinhydrone 2·5 and 4·2; and 2-methyl-1,4-naphthoquinone 2 and 1·6; the figure for the medium alone being 214·2 mg.

The same general results were obtained in a similar series of experiments with *Fusarium oxysporum* var. [f.] *cubense* and *F.o.* var. *vanillae* as test organisms.

New vegetable varieties. List 1.—*Proc. Amer. Soc. hort. Sci.*, 63, pp. 503–525, 1954.

New vegetable varieties introduced by North American Federal and State institutions during the years 1936 to 1954 are listed in chronological order under each vegetable, together with essential information regarding their origin and characteristics. Amongst those stated to possess disease resistance are the bean [*Phaseolus vulgaris*] varieties Canfreezer (Giant Stringless Greenpod × Ideal Market) released in 1948, Bonita (No. 1632) released in 1947, and Criolla (Bonita × Selection 210) released in 1953, all with resistance to rust [*Uromyces appendiculatus*: *R.A.M.*, 32, p. 602]; and Clipper (Burbank × Beauty) released in Canada in 1949, resistant to anthracnose [*Colletotrichum lindemuthianum*: 31, p. 266], bean mosaic [virus: 32, p. 602; 33, p. 574], common blight [*Xanthomonas phaseoli*: 31, p. 266], and halo blight [*Pseudomonas medicaginis* f.sp. *phaseolicola*: loc. cit.].

New cucumber varieties possessing resistance to cucumber mosaic virus [33, pp. 700, 709] are Yorkstate Pickling (Chinese Long × Early Russian) × National Pickling released in 1950, Niagara (Kansas 1913–6–4–1–1–9–2–14–6 × Cubit) released in 1951, Ohio MR 17 (Chinese Long, Early Russian, and National) released in 1952, and Puerto Rico Nos. 10 and 27 (both from Chinese Long × P.R. 39) released in 1950. Resistance to downy mildew [*Pseudoperonospora cubensis*: 33, p. 72] is claimed for the cucumbers P.R. 39 (Chinese Long × Black Diamond) released in 1944, as well as for P.R. 10 and 27. Highmoor (Longfellow × Chicago Pickling inbred, backcrossed to Straight 8), released in 1948, is resistant to scab [*Cladosporium cucumerinum*: 33, p. 592].

Two new eggplant varieties released in 1944 and resistant to [unspecified] wilt are Puerto Rican Beauty (Black Beauty × native strain) and Rosita (Native White × Black Beauty).

Lettuce varieties resistant to tipburn [32, p. 359] are Premier Great Lakes released in 1949, Progress (Imperial 44 × unnamed hybrid) released in 1949, and Jade (a complex hybrid) [33, p. 652] released in 1954. Parris Island cos (P.I. 120965 × Dark Green), released in 1952, is resistant to lettuce mosaic [virus: loc. cit.].

Some resistance to all known races of powdery mildew [*Erysiphe cichoracearum*: 33, p. 72] is claimed for the muskmelon variety Honey Ball No. 306 (Weavers Special × Hales Best) released in 1941. Purdue 44 (inbred from Hales Best type), released in 1944, is resistant to *Alternaria* [*cucumerina*: 32, p. 360] and Minnesota Midget, of unknown parentage, released in 1948, is resistant to *Fusarium bulbigenum* var. *niveum* [33, p. 403].

A new [chilli] pepper variety, Puerto Rico Perfection (Perfection × P.R. Wonder), released in 1948, is stated to be resistant to [? tobacco] mosaic [virus: 31, p. 418; 33, p. 469].

The pumpkin variety Fortuna (seven generations of selection from a native strain), released in 1950, is resistant to downy mildew [*P. cubensis*].

Tomato varieties resistant to *Fusarium* wilt [*F. bulbigenum* var. *lycopersici*: 33, pp. 566, 691] are Purdue 1361 (Rutgers × Indiana Baltimore), released in 1952, and Tippecanoe (11–28–1 × Michigan State Forcing) released in 1953. Cariba (Marglobe × Platillo), released in 1953 in Puerto Rico, is adapted to hot, moist weather, and is resistant to blights [*A. solani*: 33, p. 566 and *Phytophthora infestans*: 33, p. 187]. Resistance to *Verticillium albo-atrum* is claimed for Loran Blood (Utah VR 4 × (Utah No. 665 (Peru Wild) × several tomato varieties, the last of which was Stone) and VR Moscow (Utah VR 11 × (Utah No. 665 (Peru Wild) × several tomato varieties, Moscow being the recurring parent in the last five backcrosses) [31, p. 259; 33, p. 709], both being released in 1953.

An alphabetical index of the new varieties is appended to the list.

McKeen (C. D.). **Methyl bromide as a soil fumigant for controlling soil-borne pathogens and certain other organisms in vegetable seedbeds.**—*Canad. J. Bot.*, 32, 1, pp. 101–115, 2 pl., 1954.

The efficiency of dowfume MC–Z (containing methyl bromide [*R.A.M.*, 31, p. 248; 33, p. 49]) as a fumigant for controlling diseases in seed-bed soils and in the production of vegetable seedlings under glass was studied at the Division of Botany and Plant Pathology, Ottawa. There was a differential response by the microflora of a sandy loam compost soil to the lethal action of the fumigant. In general, fungi were destroyed at lower concentrations than bacteria and actinomycetes. Of the pathogenic fungi tested, *Fusarium oxysporum* f. [*bulbigenum* var.] *niveum* on muskmelon and a *Fusarium* sp. causing root decay of onion seedlings carried the most resistance to the fumigant, muskmelon wilt being controlled by 1½ lb. per 100 cu. ft. in sandy loam and the onion disease by 2 lb. in muck soil, while other fungi, including *Pythium* sp. infecting onions and *Rhizoctonia* [*Corticium*] *solani* causing damping-off of muskmelon, were destroyed by only ⅗ lb. [cf. 33, p. 258]. The tolerance of the bacteria varied more widely. *Xanthomonas vesicatoria* on tomato and [chilli] pepper and *Rhizobium trifolii* were destroyed at dosages of 1 to 2 lb. while *Pseudomonas tomato* from tomato and several spore-forming bacteria occurring in the soil were not destroyed at rates of 4 lb. per 100 cu. ft.

Fumigation also resulted in the increased and more uniform growth of the seedlings; cucumber and muskmelon made better growth in fumigated than in steam sterilized soil, while other vegetables showed the opposite effect.

Martin (W. J.) & Atkins (J. G.). **Results of vegetable seed treatments in Louisiana.**—*Plant Dis. Reptr*, 38, 5, pp. 348–349, 1954. [Multilithed.]

Pot experiments to test the effect of various newer seed treatments on vegetables [cf. *R.A.M.*, 30, p. 7; 33, p. 515] were carried out in 1952–3 at Louisiana Agricultural Experiment Station, Baton Rouge, using arasan, dow 9B, orthocide [captan] 75, phygon, spergon, semesan, thiram, vancide 51ZW [zinc salts of dimethyl dithiocarbamic acid and 2-mercaptobenzothiazole: 33, p. 651] and L.S.D. (5 and 1 per cent.). Highly significant increases in emergence of mustard and beet were obtained with all the treatments; spinach with all except captan 75, semesan, and spergon; [chilli] pepper with arasan, captan 75, phygon, thiram and vancide 51ZW; and eggplant with captan 75. Spergon decreased emergence of eggplant, dow 9B that of chilli and radish, and both fungicides that of tomato.

Buhl (C.). **Molybdänmangel bei Blumenkohl.** [Molybdenum deficiency in Cauliflower.]—*Gartenvelt*, 54, 7, pp. 116–117, 1 fig., 1954.

In connexion with the recent demonstration of molybdenum deficiency in northwest German cauliflower plantings [cf. *R.A.M.*, 33, p. 193], the symptoms of the disorder are described and directions given for its control by the maintenance of a neutral reaction in the nursery beds and treatment of the soil before planting out with sodium molybdate at 4 kg. per ha.

Knoppien (P.), Schmidt (G. J.), & Van der Waal (M. A.). **De bestrijding van wolf in Spinazie (Peronospora spinaciae (Mont.) de By).** [The control of downy mildew on Spinach (*Peronospora spinaciae* (Mont.) de By).]—*Meded. Dir. Tuinb.*, 17, 3, pp. 228–232, 1954. [English summary.]

In 1953 effective control of downy mildew (*Peronospora spinaciae*) [*P. effusa*] on early spinach under glass in the Utrecht district of Holland was obtained by spraying three times with 3 per cent. aaphytora (a zineb preparation), using 1 l. per $\frac{1}{40}$ acre for each application. In outdoor trials dusting with the same compound at 0·3 kg. per $\frac{1}{40}$ acre gave almost as good results as spraying. The conspicuous

deposit left on the foliage after the treatment of glasshouse plants was much less noticeable in the open.

GIDDINGS (N. J.). **Two recently isolated strains of curly top virus.**—*Phytopathology*, 44, 3, pp. 123–125, 1 fig., 1954.

This is an expanded account of the characteristics of beet curly top virus strains 11 and 12, preliminary notes on which have already appeared [*R.A.M.*, 33, p. 400].

STEUDEL (W.) & HEILING (A.). **Die Vergilbungskrankheit der Rübe. Zusammenfassender Bericht über die in den Jahren 1947–1952 in Westdeutschland durchgeführten Untersuchungen zur Epidemiologie, Verbreitung, wirtschaftlichen Bedeutung und Bekämpfung dieser Virose.** [The yellows disease of Beet. Comprehensive report of the studies carried out in the years 1947 to 1952 in Western Germany on the epidemiology, distribution, economic importance, and control of this virosis.]—*Mitt. biol. ZentAnst. Berl.* 79, 132 pp., 21 graphs, 5 maps, 1954.

Much of the information in this exhaustive survey of five years' investigations on the beet yellows virus situation in Western Germany [*R.A.M.*, 29, p. 395; 33, p. 194, *et passim*] has already been noticed in this *Review*. The salient features of the report may be summarized as follows. Three grades of infection are differentiated, (*a*) severe, with precocious symptom development, invariably culminating in total infection and predominating over large areas in North Rhineland–Westphalia and the Palatinate; (*b*) moderate, with not more than 60 per cent. infection in early autumn and later appearance of symptoms than in (*a*), causing appreciable damage only under adverse growth conditions and extending during the period under review towards the north, south, and east; and (*c*) mild, with not more than 20 per cent. infection at the beginning of the autumn; damage negligible.

The accelerated development of aphids in the climatically favourable centres of virus infection, such as Rhineland and Westphalia, leads to earlier flights and generally heavier colonization than, for instance, in North Germany, with a correspondingly protracted infection period.

In comparative experiments on the reduction of spring infection by the two principal vectors, *Myzodes* [*Myzus*] *persicae* and *Doralis* [*Aphis*] *fabae*, the latter generally caused only half as much damage as the former.

The possibilities of control are discussed. Aphicidal treatment is likely to be profitable chiefly in areas of heavy infestation and under conditions of enhanced liability to infection.

SCHREIER (O.) & RUSS (K.). **Über den Massenwechsel von Doralis fabae Scop. und Myzodes persicae Sulz. und seine Bedeutung für das Auftreten der virösen Rübenvergilbung in Österreich.** [On the mass migration of *Doralis fabae* Scop. and *Myzodes persicae* Sulz. and its significance in the spread of Beet yellows virus in Austria.]—*PflSchBer.*, 13, 1–3, pp. 1–43, 10 graphs, 1954.

Investigations were carried out in 1953 on the experimental grounds of the Plant Protection Institute, Fuchsenbigl in Marchfeld, Austria, to determine the significance of outbreaks of *Myzodes* [*Myzus*] *persicae* and *Doralis* [*Aphis*] *fabae* in the spread of virus yellows of sugar beet [*R.A.M.*, 33, p. 460 and preceding and following abstracts]. Two main periods of outbreak occurred, May to July and the end of August, with *A. fabae* predominating. The aphids preferred the outer leaves to the heart leaves, yellowing leaves to the green foliage, and plants sown in midsummer to late-sown. Systox [see next abstract] sprayed at 440 ml. per ha. did not appreciably affect yellowing or yield, though it reduced aphid infestation. Subject to confirmation by further experiments, it is concluded that *A. fabae* is an important vector of sugar beet yellows in Austria and that seed crops may form centres of infection.

Wenzl (H.) & Krexner (R.). **Versuche zur Bekämpfung der Vergilbungskrankheit der Rübe.** [Experiments on the control of Beet yellows disease.]—*PflSchBer.*, 12, 7–8, pp. 105–128, 1954. [English summary.]

Following the 1952 severe epiphytotic of beet yellows virus, involving some 35,000 ha. in Lower Austria [see preceding and next abstracts] and Burgenland, experiments were carried out in 1953 to determine the efficiency of treatment with systox [*R.A.M.*, 33, p. 516 and preceding abstract] for the extermination of the aphid vector, *Doralis* [*Aphis*] *fabae*, in the control of the disease. Where the incidence of infection did not exceed 7 per cent., three applications at the rate of 400 ml. per ha. reduced the numbers of diseased plants by half or sometimes two-thirds, and in four out of five fields a single treatment at the onset of the production of apterae on the plants prevented aphid development until the population reached a climax 27 to 34 days later. However, in view of the very considerable fluctuations in the losses caused by the virus (which in 1953, for instance, were less than 1 per cent. of the crop), treatment with systox, even supposing a 50 per cent. reduction of damage were achieved, would not be profitable at the existing price levels for sugar beet.

There was less infection in stands sown early in March or in mid-May than in those of April or the beginning of May. A number of plants were jointly infected by beet yellows virus and downy mildew (*Peronospora schachtii*), the former causing chlorosis, hardening, and brittleness of the leaves and the latter necrosis of the under side of the veins and petioles and the exudation of a sugary liquid.

Wenzl (H.). **Beobachtungen zur Frage der Überwinterung des Vergilbungsvirus in den österreichischen Zuckerrübegebieten.** [Observations on the question of overwintering of the yellows virus in the Austrian Sugar Beet regions.]—*PflSchBer.*, 12, 5–6, pp. 88–94, 1954. [English summary.]

In various districts of Lower Austria in 1953 an appreciable degree of early infection by beet yellows virus [see preceding abstracts] developed exclusively near diseased seed crops, especially those of fodder beets grown by farmers for their own use. There was no evidence in July of spread from spinach seed crops, nor are groundkeepers (which are very rarely found) of any material importance as a source of infection. The only aphid detected in random tests on stored beets was *Rhopalosiphoninus latysiphon*. Emergence of the tops from leaf clamps cannot occur under local storage conditions.

Hull (R.). **Sugar Beet yellows. Recent developments in control.**—*Brit. Sug. Beet Rev.*, 22, 3, pp. 113–116, 1954.

As a precaution against beet yellows virus [*R.A.M.*, 33, p. 585] all sugar beet steckling beds in Great Britain are now either grown in isolated areas planted under a cover-crop of barley, or sprayed regularly with an insecticide, and inspected under the certification scheme [33, p. 273]. In 1950–1 all stecklings were accepted for planting and the percentage of infection in the seed crop was 0·68. In 1951–2 the mean level of infection in the seed crop was reduced from 1·3 to 0·9 per cent. by discarding seven steckling beds. In 1953–4 the mean incidence in the 51 certified steckling beds was 0·61 per cent. compared with 2·57 in all steckling beds. The last figure was high because of the abundant multiplication of *Myzus persicae* on sugar beet and other crops in July, resulting in an exceptionally large movement of winged aphids to germinating stecklings in early August before they could be sprayed.

The beds in isolation areas were generally satisfactory, the average incidence of infection being 0·76 per cent. Spraying controlled the disease in Bedfordshire but not in Lincolnshire; the mean percentage of infection in sprayed beds as a whole

was 4·22. The 11 beds grown under cover-crops in Essex and elsewhere and sprayed after the cover-crop was cut showed an average of 0·17 infection.

The percentages of mangold clamps and roots infested by aphids in April, 1953, in an area with 14·7 clamps per 10 sq. miles, were 19·2 and 6·9, respectively, the corresponding figures for May (5·5 clamps) being 38·1 and 11·7, respectively.

Koch (F.). **Das Auftreten verschiedener seltener vorkommender Krankheiten und Schädlinge der Rüben in Niederbayern 1953.** [The appearance of some rare diseases and pests of Beets in Lower Bavaria 1953.]—*Pflanzenschutz*, 6, 3, pp. 33–34, 3 figs., 1954.

During 1953 the following were observed on beets in Lower Bavaria: downy mildew (*Peronospora schachtii*) [see above and below, pp. 13, 15], rust (*Uromyces betae*), violet root rot (*Rhizoctonia violacea*) [*Helicobasidium purpureum*], crown gall (*Bacterium tumefaciens*), and two forms of scab, one caused by *Actinomyces* and the other by *B. scabiegenum* [*Erwinia scabiegena*]. Brief notes are given on symptomatology and control.

Wenzl (H.). **Grundfragen der Spritzmittel-Anwendung bei der Bekämpfung von Krankheiten im Feldbau.** [Basic problems of spraying in disease control in the field.]—*Pflanzenarzt*, 7, 6, pp. 6–7, 1954.

Between the middle of June and the end of August, 1953, three plots of beet in Austria were given four sprays each of the usual [copper] fungicide against *Cercospora* [*beticola*: *R.A.M.*, 33, p. 195 and next abstract] to ascertain the influence of liquid volume on effectiveness. Equal amounts of solid fungicide were distributed in (1) 220 l. and (2) 310 l. of liquid per ha., both series being applied with a tractor-drawn sprayer. While unsprayed plots had high incidence of leaf spot, the amount on the two sprayed plots was slight. The high volume spray was insufficiently advantageous to justify altering the time- and water-saving practice of spraying with only 200 l. With a knapsack sprayer, however, 200 l. per ha. cannot be distributed with sufficient accuracy, and its protective effect is inferior to that of 400 l.

The author considers that special apparatus for spraying the lower surfaces of leaves give no advantages.

Wenzl (H.). **Fortschritte in der Bekämpfung von Rübenkrankheiten.** [Progress in the control of Beet diseases.]—*Pflanzenarzt*, 7, 7, pp. 1–2, 1954.

Surveying 15 years of combating beet diseases, the author concludes that against *Cercospora* leaf spot [*C. beticola*: see preceding abstract] fungicides based on copper have given the best results. Four sprays of 1·5 to 2 kg. of metallic copper per ha. (or twice the quantity of copper-containing fungicides, or four times the amount of Bordeaux mixture) gave satisfactory results even in the most heavily infected regions of Austria. In copper spraying tests at Enns in 1946 and 1947 sugar production was increased by 16 and 18 per cent., respectively. In three years' testing undertaken by the author in collaboration with A. Graf and J. Schönbrunner, a very susceptible variety produced 15 per cent. more beet after spraying. The effect of spraying decreased with increasing resistance, but four applications were still worth while with the comparatively resistant Buszczynski CLR. In 1953 the variety Kleinwanzleben CR was so resistant that spraying was no longer worth while even in years of heavy leaf spot infection [cf. *R.A.M.*, 33, p. 195]. The latest results seem to show that one year's storage of seed lessens but does not always remove the threat of infection. Phosphates are recommended as a disease preventive.

In a two-year experiment conducted by R. Fischer on very heavy soil at Petzenkirchen in the Lower Alps spraying increased crop yield by 16 per cent. at a cost

per ha. of only the value of 15 kg. of sugar. The author's experiments in the same area in 1937 and 1953 resulted in a crop increase of 5 per cent.

Downy mildew (*Peronospora schachtii*) [32, p. 55], ascribed to wet spring weather and infection from stored seed, is causing increasing damage to Austrian crops. Enns sugar factory secured good results in reducing beet losses in clamps by introducing cool night air through ventilator pipes, but this method could not be used for clamps covered with earth. If the fields did not have to be cleared for winter grain, it would be easier to obtain good, ripened roots.

Knapp (E.). **Zur Frage der Bedeutung der Übertragung von Cercospora beticola durch das Rübensaatgut. (Bericht über dreijährige Versuche.)** [On the question of the significance of the transmission of *Cercospora beticola* through Beet seed. (Report on three years' experiments.)]—*Zucker*, 7, 5, pp. 91–97, 1954.

This is a detailed, fully tabulated survey of experiments covering the period from 1950 to 1952, inclusive, and conducted in different parts of Germany under the supervision of the Rosenhof branch of the Max Planck Breeding Institute, to determine the effect on beet yields of seed transmission of *Cercospora beticola* [*R.A.M.*, 33, p. 206].

In common with other workers on the same subject [32, p. 295 *et passim*] the author found that plants produced from infected seed develop leaf spot earlier than those from healthy material and that the differences between the two lots remain noticeable far into the growing season. Although none of the seed treatments available at present is completely effective against the pathogen, the incidence of infection was substantially reduced by dusting with ceresan, albertan [33, p. 7], U.T. 12,272, and Fahlberg-List 97 (all at 800 gm. per doppelzentner [2 cwt.]), as well as by five minutes' immersion in water heated to a temperature of 70° C. or 30 minutes at 60°. It is estimated that the use of infected seed led to yield reductions of up to 100 cwt. per ha., with a corresponding fall in sugar content of 0·8 per cent., while an increase in ash and soluble nitrogen impaired the value of the crop for manufacturing purposes. These results are considered to leave no doubt as to the importance of seed-borne leaf spot infection on the quantity and quality of the beet harvest.

Skotland (C. B.). **Aphid transmission of the Wisconsin Pea streak virus.**—Abs. in *Phytopathology*, 43, 9, p. 484, 1953.

The results of three years' greenhouse experiments are stated to have established the pea aphid, *Illinoia pisi* [*Acyrthosiphon pisum*], as an inefficient vector of the Wisconsin pea streak virus [*R.A.M.*, 32, p. 383], only about 5 per cent. of the trials giving positive results. The acquisition threshold was found to be as low as 15 seconds, higher percentages of transmission being secured with one- and five-minute feeding periods. The inoculation threshold was five minutes. In serial transfers single aphids could infect only one plant of a series. In colony transfers the virus persisted in the vector for three hours or longer. Pea streak virus, which is provisionally assigned to the non-persistent group of viruses, was transmitted from red and alsike clovers and *Melilotus officinalis* to the Perfected Wales pea variety.

Buxton (E. W.) & Storey (I. F.). **The occurrence of Pea wilt in Britain.**—*Plant Path.*, 3, 1, pp. 13–16, 1 pl., 1954.

In an inquiry started in 1952 into the *Fusarium* complex associated with pea failures in Britain a study was made of affected material from various parts of Essex, Suffolk, and other localities. Of 452 isolations from fragments of root and stem vascular tissue from plants with wilt symptoms, 381 (about 84 per cent.)

yielded *Fusarium* species [cf. *R.A.M.*, 33, p. 63]. Most of the isolates belonged to *F. oxysporum* [32, p. 602], the identifications being confirmed by W. L. Gordon.

A high proportion of the isolates from plants from Sweffling, Suffolk, exhibiting symptoms agreeing with Wisconsin pea wilt [8, p. 622; 26, p. 1] were of *F. oxysporum* var. *redolens* [31, p. 597]. It is distinguished from the species by its buff colour on potato dextrose agar and by slight differences of macrospore measurement and shape. Later isolates, particularly those from roots with cortical rot, were mixtures of *F. oxysporum* and *F. solani*, and once all three fungi were found growing from one point on one root fragment. The relative pathogenicity of the three is not clear, but in general *F. oxysporum* is present in the diseased tissue of the stele more often than *F. solani* and occurs earlier in the season.

In small-scale pathogenicity tests, in which three pea varieties and five *F. oxysporum* isolates were used, inoculum was placed under each pea seed on sowing in unsterilized John Innes compost. Symptoms closely resembling those seen in the field were reproduced, as they were also when Kelvedon Triumph peas were grown in boxes of soil taken from beneath diseased pea plants in the field.

No evidence was obtained of any relationship between the incidence of *Fusarium* wilt and previous cropping with peas in an affected field; most of the wilt outbreaks occurred where peas were growing for the first time. The possibility that wilting might have been due to seed infection was tested at Sweffling, but no *F.* was isolated from the sample seed. The best control method [cf. 31, p. 44] would appear to consist in breeding resistant varieties [32, p. 114; 33, p. 651].

YARWOOD (C. E.). **Zinc increases susceptibility of Bean leaves to Tobacco mosaic virus.**—*Phytopathology*, 44, 5, pp. 230–233, 1 fig., 1 graph, 1954.

Further experiments at the Department of Plant Pathology, University of California, Berkeley, again demonstrated the enhanced susceptibility of Pinto bean (*Phaseolus vulgaris*) leaves to tobacco mosaic virus induced by 10 minutes' immersion in 0·001 to 0·03 per cent. zinc sulphate [*R.A.M.*, 32, p. 420]. The same treatments decreased the numbers of tobacco mosaic lesions on *Nicotiana glutinosa* leaves.

KOZLOV (F. B.). Сорта Фасоли для торфяных почв. [Bean varieties for peat soils.]—Земледелие [*Zemledelie, Moscow*], 2, 5, p. 123, 1954.

The following bean [*Phaseolus vulgaris*] varieties are recommended for cultivation on peat soils in the U.S.S.R.: Beloruskaya 288 [White Russian 288] and Mestnaya krasnaya [Local Red], both resistant to anthracnose [*Colletotrichum lindemuthianum*: *R.A.M.*, 31, p. 516] and *Ascochyta* [*phaseolorum*: 20, p. 233], and Beloruskaya 145/1, resistant to [unspecified] fungal diseases.

SHNEIDER (Y. I.). Опудривание семян Фасоли гранозаном для борбы с бактериозом. [Dusting Bean seeds with granosan for the control of bacteriosis.]—Земледелие [*Zemledelie, Moscow*], 2, 4, pp. 109–111, 1954.

Experiments at the Moscow Station of Plant Protection, U.S.S.R., showed that pre-sowing dusting of bean [*Phaseolus vulgaris*] seed with granosan (2 to 5 gm. per kg. seed) gives good control of bacteriosis [? *Pseudomonas medicaginis* f. *phaseolicola* and *Xanthomonas phaseoli*: *R.A.M.*, 9, p. 383; cf. 31, p. 220]. Concentrations of 3 to 5 gm. per kg. seed were the most effective, reducing infection in Bomba belaya 08 and Krasnodarskaya 19305, respectively, by 24 to 37 and 29 to 33 per cent. and increasing germination by 32 to 48 and 5 to 22 per cent. In another trial dusting seed with granosan at 300 gm. per z[entner] reduced seedling infection by an average of 11·5 per cent. and foliage infection by 10 per cent.

The recommended date for sowing beans in the Krasnodarskaya region is the

middle of May, but seed dusting with granosan will give high yields even when seeds are sown earlier (last ten days in April).

Schrödter (H.). **Agrarmeteorologische Untersuchungen im Rahmen der Antibiotica — Forschung in der Pflanzenpathologie. (Vorläufige Mitteilung.)** [Agrario-meteorological studies within the framework of research on antibiotics in plant pathology. (Preliminary communication.)]—*Angew. Met.*, 2, 1, pp. 23–26, 1954.

In this further contribution to this series [*R.A.M.*, 33, p. 263] the author reports experiments on the control of bean [*Phaseolus vulgaris*] grease spot [*Pseudomonas medicaginis* f.sp. *phaseolicola*] at the Agrario-Meteorological Research Station, Aschersleben, Germany, by means of seed treatment with penicillin and streptomycin [33, p. 574] or culture filtrates of *Penicillium* and *Streptomyces* spp. Better results were obtained when either high or low temperatures prevailed during the first two days after sowing than under more moderate conditions.

Schuster (M. L.) & Christiansen (D. W.). **An orange-colored bacterium comparable to Corynebacterium flaccumfaciens (Hedges) Dowson causing Bean wilt.**—Abs. in *Phytopathology*, 43, 9, p. 483, 1953.

Representative samples of bean [*Phaseolus vulgaris*] seed of the Great Northern and Pinto varieties from western Nebraska harboured about 30 per cent. infection by a strain of *Corynebacterium flaccumfaciens* [*R.A.M.*, 32, p. 5] which gave them an orange colour. A similar discoloration resulted from inoculation of the upper nodes or rubbing the pods with a bacterial suspension. The orange tint is helpful in the differentiation of *C. flaccumfaciens* from *Xanthomonas phaseoli*, which is also prevalent in the region.

Atkins (J. D.) & Lewis (W. D.). **Rhizoctonia aerial blight of Soybeans in Louisiana.** —*Phytopathology*, 44, 4, pp. 215–218, 1 fig., 1954.

The aerial blight of soy-beans caused by *Rhizoctonia microsclerotia* was again observed in Louisiana [*R.A.M.*, 31, p. 367] during 1952, the third consecutive year of its occurrence. Of eight varieties or selections tested, Acadian, Roanoke, Improved Pelican, and N46–2881 showed a high degree of resistance to the disease under field conditions. Additional hosts of the pathogen include *Crotalaria* sp., *Dolichos* sp., *Jacquemontia tamnifolia*, *Cyperus* sp., *Mollugo verticillata*, *Digitaria ischaemum*, *Echinochloa colonum*, and *Eleusine indica*.

Jacks (H.) & Dawe (T. C. R.). **Prevention of Onion mildew.**—*N.Z. J. Agric.*, 88, 4, p. 342, 1954.

Onion downy mildew (*Peronospora destructor*) is of major importance in seedling beds and field crops in the Pukekohe district of New Zealand [*R.A.M.*, 23, pp. 5, 474], reducing yield in some crops by 25 per cent. As the result of control trials with various fungicides, copper oxychloride (5 lb. in 100 gals.) plus a commercial spreader sticker (p.e.p.s. or YF 3198) and Bordeaux mixture (6–8–100) plus 0·5 gal. summer oil are recommended. Applications should be started in seed beds when seedlings are 4- to 6-in. high and continued at 10-day intervals until they are ready for transplanting. Field crops should be sprayed at 14- to 20-day intervals from the early seedling stage until three weeks before harvest.

Segall (R. H.). **Onion blast or leaf spotting caused by species of Botrytis.**—Abs. in *Phytopathology*, 43, 9, p. 483, 1953.

Various species of *Botrytis*, including *B. allii*, *B. cinerea*, *B. tulipae*, and *B. paeoniae*, were found to be concerned in the etiology of an onion disease known in New York as 'blast' [*R.A.M.*, 32, p. 6] and formerly attributed to physiogenic

factors. In commercial fields *B. allii* [30, p. 211; 31, p. 529] was found sporulating profusely on dead onion foliage, which provides the primary source of inoculum. Typical symptoms developed on leaves inoculated with the above-mentioned species, a minimum period of 22 hours of saturated humidity being requisite for spot formation, while light is also essential.

McKeen (C. D.). **Tobacco etch in Peppers in southern Ontario.**—*Canad. J. Bot.*, 32, 1, pp. 95–100, 2 pl., 1954.

The widespread occurrence in Ontario of the disease of sweet [chilli] peppers (*Capsicum frutescens*) caused by tobacco etch virus, frequently in association with tobacco and cucumber mosaic viruses, an abstract on which has already been noticed [*R.A.M.*, 33, p. 276], is attributed to the prevalence of the vector, *Myzus persicae*. The various strains of etch present were readily differentiated on Burley tobacco, the symptoms varying from mild to severe etching and stunting [31, p. 520]. Detailed descriptions of the symptoms produced on sweet, hot, and semi-hot varieties are provided [cf. 33, p. 402].

It is postulated that the 1950 epidemic may have resulted from the migration of winged adult aphids from etch-infested tobacco crops in Kentucky, the virus overwintering in Ontario in each successive year in perennial weed hosts. The virus could also have been introduced into Ontario afresh each season, either in young tomato and pepper plants imported from southern States or through wind-borne migration of *M. persicae*.

Muntañola (Maria). **A study of a newly identified Pepper disease in the Americas.**—*Phytopathology*, 44, 5, pp. 233–239, 2 figs., 1954.

Cercospora unamunoi, the agent of velvet leaf spot of chilli (*Capsicum frutescens*) [*R.A.M.*, 27, p. 406], is reported for the first time from Argentina, Brazil, El Salvador, and Venezuela. It also occurs in the southern regions of the United States. The fungus produces felted, brown-olivaceous patches on the lower leaf surfaces and indefinite, yellowish areas on the upper. The ensuing severe defoliation results in reduction of yields.

In some localities colonies of *C. unamunoi* were found to be parasitized by a species of *Botrytis* [17, p. 791] for which the name of *B. yuae* n.sp. is proposed. It produces conidiophores 180 to 250 μ long and spores 3 to 5 μ in diameter. It is related to *B. grisella* (= *B. griseola*) (*Trans. Brit. mycol. Soc.*, 3, pp. 220–225, 1910), from which it differs in the multicuspidate tips of the conidiophores and smaller spores.

Outbreaks and new records.—*F.A.O. Pl. Prot. Bull.*, 2, 8, pp. 121–122, 1954.

H. W. Moll reports that early in 1954 sorghum growing at the Experiment Station, Kota Nica, was affected by anthracnose (*Colletotrichum* sp.), not previously observed in Netherlands New Guinea. The Pretoria variety was badly attacked and showed characteristic symptoms of reddish-brown leaf spotting, red to deep violet lesions on the stalks, and a red rot in the pith; cracking of the upper part of the stalk was not observed. Mimosa Park suffered a less extensive stalk rot; Katengu developed a rather indistinct discoloration of the leaves; and Early White and Birdproof were relatively resistant.

The Horticultural Division, Department of Agriculture, Wellington, state that *Puccinia antirrhini* [C.M.I. map No. 40], intercepted in seed introduced into New Zealand in 1953, was again intercepted in 1954 in seed imported from the United States and the United Kingdom. The disease was definitely identified at Auckland, Palmerston North, and Wellington, and has evidently been present, though undetected, in New Zealand for some time.

Administration Report of the Director of Agriculture Trinidad and Tobago for the year 1952.—65+ix pp., 1953.

It is stated (pp. 32–34) in this report [cf. *R.A.M.*, 33, p. 214] that cacao witches' broom [*Marasmius perniciosus*: 33, p. 661] was still severe in places as the result of the very wet year in 1951. Although the disease is still of minor importance in Tobago, serious infections occur south-west of Man-o'-War Bay.

Witches' broom symptoms on the original cuttings of Ananca immortelle [*Erythrina micropteryx*: 33, p. 214] were not observed on the new growth, suggesting that the disease is not of virus origin. An [unidentified] pycnidial fungus has been consistently isolated from the brooms.

Evidence indicates that seedling lime disease [cf. loc. cit.] is not due to a virus and the cause remains unknown. Species of *Fusarium* have been isolated fairly consistently, but inoculation experiments were inconclusive.

A survey, made since 1950, of a field at Florissante Estate consisting of 149 20- to 30-year-old coco-nut palms, has shown losses of 31 per cent., mainly due to bronze leaf wilt [loc. cit.]; in addition 24 had 'little leaf' and three false wilt. Annual fertilizer treatments since 1950 indicated that nitrogen dressings help recovery from 'little leaf'.

Åkerman (Å.). **Årsberättelse över Sveriges Utsädesförenings verksamhet år 1953.** [Annual report on the work of the Swedish Seed Association for the year 1953.] — *Sverig. Utsädesfören. Tidskr.*, 64, 2, pp. 99–119, 1 graph, 1954.

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, 32, p. 11]. At Svalöf *Cercosporella herpotrichoides* and other straw-breaking fungi, combined with heavy rain and strong winds, were responsible for considerable lodging in the exceptionally late-sown winter wheat crop.

A high degree of resistance to clover rot [*Sclerotinia trifoliorum*: 33, p. 744] was shown by tetraploid strains of red clover at the Östgöta, Västgöta, and Västernorrland branches of the Association. Pasture grasses in Västernorrland were heavily damaged by *Typhula* [33, p. 743], but certain strains of timothy [*Phleum pratense*] and meadow fescue [*Festuca pratensis*] of northern origin have given encouraging indications of resistance.

Bongini (Virginia). **Segnalazioni fitopatologiche.** [Phytopathological records.] — *Ann. Sper. agr.*, N.S., 7, 3, pp. xvii–liv, 11 figs., 1953. [English summary.]

Notes are given on new and interesting diseases of plants recorded in Piedmont, Italy, from 1948 to 1952. In 1949 vine nurseries in the province of Alessandria lost 30 per cent. or more of Rupestris du Lot layers as a result of excoriosis (*Phoma flaccida*) [cf. *R.A.M.*, 19, p. 193], an uncommon disease in Italy. At the end of May, 1951, after cold, wet weather, vines at Acqui were attacked by *Phyllosticta bizzozeriana*, causing leaf spot and wilting.

In 1948 apple orchards growing in very good conditions and regularly sprayed suffered severe losses from *Fusicladium dendriticum* [*Venturia inaequalis*: 32, p. 303]. At the end of the summer of 1949 Martinone pears at Mondovì developed fruit spot due to *Septoria piricola* [*Mycosphaerella sentina*: 26, p. 65]; the leaves remained unaffected. In 1949 peach trees near Turin, which the year before had developed infection of the leaves by *Clasterosporium carpophilum* [26, p. 229], bore very small fruits which became infected by *Aureobasidium* [*Pullularia*] *pullulans* in association with *Phyllosticta persicae* [loc. cit.]. Apricot trees at Finalmarina were affected in 1949 by a sudden withering of the whole tree resembling 'apoplexy' and caused by *Verticillium albo-atrum* [cf. 14, p. 641; 27, p. 139]. As a result of weather conditions that favoured infection, walnut trees at Chiusa Pesio in 1948 developed severe premature leaf fall due to infection by *Marssonina juglandis* [*Gnomonia leptostyla*: 25, p. 427; 28, p. 315]. In 1949 peas at Alpignano (Turin)

developed severe distortion and necrotic leaf spot caused by a fungus tentatively identified as *Megacladosporium pisicolum* [*Cladosporium cladosporioides* f. sp. *pisicola*].

Härle (A.). **Die wichtigsten Krankheiten und Schädlinge an Kulturpflanzen im Jahre 1951 im Bereich der Bundesrepublik Deutschland.** [The principal diseases and pests of cultivated plants in the year 1951 in the zone of the Federal Republic of Germany.]—*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), *Stuttgart*, 6, 10, pp. 150–158, 1954.

Much of the information in this report, prepared on the usual lines [cf. *R.A.M.*, 31, p. 535], has already been presented from other sources. Cases were notified in which wheat bunt (*Tilletia tritici*) [*T. caries*] was so severe owing to the omission of seed treatment or use of inappropriate fungicides that the grain was unfit for human consumption.

The tulip breaking virus was particularly widespread in Westphalia.

Jeremić (M.). **Pojava biljnih bolesti i štetočina na teritoriji N R Srbije u 1952 godini.** [The incidence of plant pests and diseases in the P R of Serbia in 1952.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1954*, 21, pp. 61–94, 12 maps, 1954. [English summary.]

Climatic conditions unfavourable for fungi during 1952 in Yugoslavia prevented a massive appearance of plant diseases. Isolated attacks of *Bacterium* [*Pseudomonas*] *medicaginis* var. [f. sp.] *phaseolicola* occurred on beans [*Phaseolus vulgaris*: *R.A.M.*, 27, p. 6] in the neighbourhood of Zrenjanin. Potato virosis [unspecified] was established in 30 per cent. of the plants covering an area of 15 ha. in the Takovo district. Virosis [unspecified] of eggplants spreads freely through the uncontrolled sale of infected seed. Virosis [unspecified] and leaf spot (*Ascochyta hortorum*) were of reduced importance on peppers [chilli: cf. 5, p. 15].

Taphrina pruni [31, p. 336], *T. insititiae* [11, p. 424], and *Phyllosticta prunicola* [18, p. 535] were observed on plums, the last two causing as much as 80 per cent. infection in some districts.

Venturia pirina [31, p. 594] and *Mycosphaerella sentina* [30, p. 507] caused 20 and 100 per cent. leaf infection, respectively, in pear trees in the village of Visibaba. Aecidia of *Gymnosporangium sabinae* [31, p. 353] were observed on yellowed pear leaves in November.

Some 70 to 80 per cent. apple leaves showed infection with *Physalospora cydoniae* [*P. obtusa*: 29, p. 56] in the villages of Vučkovica, Kotraža, and Dubac and 90 to 100 per cent. with *G. tremelloides* [loc. cit.], infection being so high in Serbia only; *Didymella applanata* was recorded on raspberries [C.M.I. map No. 72] in the vicinity of Čačak and Valjevo.

A slight outbreak of walnut bacterial blight (*Bacterium* [*Xanthomonas*] *juglandis*) [No. 133] was detected in northern Bačka and in Čačak.

Sclerotinia fuckeliana [*R.A.M.*, 12, p. 549; 28, p. 547] affected 30 per cent. grapes of the variety 'dinka' in one locality, while powdery mildew (*Uncinula necator*) [32, p. 10] destroyed up to 60 per cent. in others.

Other records included *Fusarium lini* on flax [C.M.I. map No. 32] in southern Banat, *Pseudopeziza medicaginis* on lucerne [No. 129], and *Rhizoctonia violacea* [*Helicobasidium purpureum*: No. 275], which infected 50 per cent. of lucerne growing on 1 ha. of land in Jagoda.

Janke (A.) & Granits (Josefine). **Über die Bekämpfung von Pflanzenkrankheiten durch Antibiotika. 1. Mitteilung. In vitro-Versuche über die Wirkung verschiedener Antibiotika auf Corynebacterium michiganense und Agrobacterium tumefaciens.** [On the control of plant diseases by antibiotics. Com-

munication 1. *In vitro* experiments on the action of various antibiotics on *Corynebacterium michiganense* and *Agrobacterium tumefaciens*.]—*Zbl. Bakt.*, Abt. 2, 108, 1–3, pp. 35–46, 1954.

At the Plant Protection Institute, Vienna, enhancement of the virulence of *Corynebacterium michiganense* [*R.A.M.*, 32, p. 540 and next abstracts] and *Agrobacterium* [*Bacterium*] *tumefaciens* [33, p. 681] was readily achieved by passage through tomato plants in the case of the former and *Pelargonium zonale* and sunflower for the latter organism. The bacteria were grown on a medium consisting of equal parts of potato water–meat bouillon and agar. The following inhibiting concentrations (per ml.) were determined by the hole and serial dilution methods for four antibiotics tested against *C. michiganense*: penicillin G 0·07 to 0·11 Oxford units, streptomycin 0·3 to 0·5γ, aureomycin 0·26 to 0·39γ, and terramycin 0·39 to 0·59γ. Penicillin exerted no effect on *B. tumefaciens*, which was inhibited by streptomycin at 0·62 to 0·75γ and by aureomycin and terramycin at 0·78 to 0·88γ. The admixture of humus and compost soil with the medium considerably reduced the antibiotic efficiency of penicillin and was slightly detrimental to that of aureomycin and terramycin, while streptomycin was unaffected. Clay and sandy soils did not limit the activity of any of the antibiotics. A decline in virulence of *C. michiganense* was accompanied by loss of sensitivity to penicillin and streptomycin.

Granits (Josefine) & Janke (A.). **Über die Bekämpfung von Pflanzenkrankheiten durch Antibiotika. 2. Mitteilung. Versuche zur Bekämpfung der durch Corynebacterium michiganense bewirkten Tomatenwelke mittels Penicillins.** [On the control of plant diseases by antibiotics. Communication 2. Experiments on the control of the tomato wilt caused by *Corynebacterium michiganense* by means of penicillin.]—*Zbl. Bakt.*, Abt. 2, 108, 1–3, pp. 47–65, 1954.

In connexion with the rapid spread of an epiphytotic of *Corynebacterium michiganense* on an experimental planting of Bonny Best tomatoes at the Plant Protection Institute, Vienna [see preceding abstract], culminating in an incidence of 92 per cent., transmission of the pathogen through the soil and seed was demonstrated. The authors found that cutting off the tap-root tip and dipping the plants in a bacterial suspension was the most effective method of inoculation [*R.A.M.*, 28, p. 425; 32, p. 155].

Some prospect of success in the control of seed infection is offered by 48 to 96 hours' immersion of the roots of four-week-old seedlings in a penicillin solution (changed daily) of 500 Oxford units per ml.

Janke (A.) & Granits (Josefine). **Über die Bekämpfung von Pflanzenkrankheiten durch Antibiotika. 3. Mitteilung. Über die Bekämpfung des durch Agrobacterium tumefaciens verursachten Pflanzenkrebses mittels Antibiotika.** [On the control of plant diseases by antibiotics. Communication 3. On the control of crown gall caused by *Agrobacterium tumefaciens* by means of antibiotics.]—*Zbl. Bakt.*, Abt. 2, 108, 1–3, pp. 66–75, 1954.

It is concluded from experimental evidence secured at the Plant Protection Institute, Vienna, using *Pelargonium zonale* as a host plant, that natural infection by *Agrobacterium* [*Bacterium*] *tumefaciens* spreads through the soil, probably with the assistance of water rather than by independent movement. *P. zonale* and sunflower were effectively inoculated by injection into the stems of $\frac{1}{20}$ to $\frac{1}{25}$ ml. of a suspension of the pathogen containing approximately 10,000 cells per ml., dipping the decapitated roots or the cut surface of seedlings in a similar solution, or insertion into the stems of tumour fragments or emulsion.

The favourable results obtained by American workers in the external treatment of crown gall tumours with penicillin [*R.A.M.*, 24, p. 406; 27, p. 276; 29, p. 146] were not substantiated by the authors, but a complete cure was effected in three

days by streptomycin, aureomycin [cf. 31, p. 175 and above, p. 21], and terramycin at 10γ per ml. Combined with previous surgical removal of the galls the aureomycin treatment acted within 18 hours at a concentration of 25γ and in two at 50γ.

TAMM (BARBARA). **Experimentelle Untersuchungen über die Verbreitung des bakteriellen Pflanzenkrebses und das Auftreten von Sekundärtumoren.** [Experimental studies on the distribution of the bacterial crown gall and the occurrence of secondary tumours.]—*Arch. Mikrobiol.*, 20, 3, pp. 273–292, 1 fig., 1954.

At the Institute of Plant Physiology, University of Göttingen, Germany, 149 out of 387 species of plants, belonging to 39 of 68 families, which were systematically investigated in one or more of the years 1951 to 1953, developed crown gall as a result of inoculation with Stapp's *Chrysanthemum frutescens* strain IIb of *Pseudomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, 25, p. 293], a total of 38·5 per cent. Of those examined several times, 20 per cent. formed tumours in one year and not in another. All the 14 Solanaceae included in the tests were susceptible and the 19 Papilionaceae resistant.

No clear-cut correlation was established between multiplication of the bacteria and crown gall development in the infected plants. Although the expressed sap of *Tropaeolum majus* exerted an antibiotic effect on the pathogen *in vitro*, inoculated plants of this species contracted the disease and the bacteria multiplied within them.

No secondary tumours developed in the absence of wounds, and only 41 (6·7 per cent.) of the 611 plants with primary crown gall produced them in these experiments, compared with 30 to 60 per cent. cited by White and Braun [cf. 22, p. 12].

PATEL (M. K.) & KULKARNI (Y. S.). **A review of bacterial plant disease investigation in India.**—*Indian Phytopath.*, 6 (*1953*), 2, pp. 131–140, 1954.

This is a review, based on the literature (46 titles), of the bacterial diseases of economic plants in India [*R.A.M.*, 33, p. 74 *et passim*]. Species representing 36 genera in 17 families are definitely affected by bacterial diseases and 18 genera in 12 families probably so.

Fourth Meeting of the Inter-American Technical Cacao Committee 1952.—*Cacao* (*Int.-Amer. Cacao Cent.*), 2, 28–33, 16 pp., 7 figs., 1952.

Most of the information in this summary of the papers presented at the session on diseases and insects at the above meeting held at Pichilingue, Ecuador, in June, 1952, has been noticed from other sources [*R.A.M.*, 33, pp. 144, 414].

Reporting on preliminary work on the control of cacao witches' broom [*Marasmius perniciosus*: 33, p. 662] in Pichilingue, R. DESROSIERS and C. BOLAÑOS state that DNC, santobrite, and paranitrophenol, when used at concentrations not phytotoxic to cacao, gave most promising control of sporophore formation. Similarly santophen-20 gave good results, but the diesel oil solvent was phytotoxic. Mention is made of a new disease in cacao propagators caused by [unspecified] fungi in the rooting medium, tentatively named 'third-day yellows'. Temporary control measures include the sterilization of the rooting medium with chloropicrin. Fermate and zerlate (both at 0·125 per cent.) also gave satisfactory control.

POSNETTE (A. F.). **Virus diseases of Cacao in West Africa : the present position.**—*Rep. Int. hort. Congr.*, 13, pp. 1224–1230, 1953. [French summary.]

The history of swollen shoot virus disease of cacao in the Gold Coast [*R.A.M.*, 32, p. 13; 33, p. 592] is briefly reviewed, giving the present state of knowledge of the disease and possible control measures.

Field experiments, 1951.—*J. Dep. Agric. Eire*, 49, pp. 158–172, 1952–1953.

In further trials on the simultaneous control of wireworms and seed-borne cereal diseases with a mixture of *gamma*-BHC and an organo-mercurial [*R.A.M.*, 32, p. 425] carried out at 86 centres in the Republic of Ireland in 1951, it is reported (p. 172) that the wheat plots were mostly free from seed-borne diseases. At four centres a slight amount of bunt [*Tilletia caries*: loc. cit.] was present on the untreated plots, also some [unspecified] seedling blight. On oats *Helminthosporium* [*Pyrenophora*] *avenae* [loc. cit.] appeared at 26 centres and was severe at 9; 16 outbreaks were confined to the untreated plots. Attacks of seedling blight and loose smut [*Ustilagoavenae*: loc. cit.] at five and two centres, respectively, were all slight and confined to the untreated plots. It is concluded that the seed-dressing is effective in controlling certain seed-borne diseases of oats and wheat.

Machacek (J. E.), Wallace (H. A. H.), Mead (H. W.), & Broadfoot (W. C.). **A study of some seed-borne diseases of Cereals in Canada. III. Effect of rate of seeding, percentage of infested kernels, and weeds, on the yield of plots sown with treated and untreated seed.**—*Canad. J. agric. Sci.*, 34, 3, pp. 240–251, 1 fig., 4 graphs, 1954.

In further studies in this series [cf. *R.A.M.*, 30, p. 603] at the Department of Agriculture, Ottawa, from 1944 to 1946, Regent wheat seed naturally infected with *Helminthosporium sativum* [33, p. 527], Erban oats with *H.* [*Pyrenophora*] *avenae* [28, p. 520], Charlottetown 80 barley with *H. sativum* [33, p. 467], and O.A.C.21 barley with *H. teres* [loc. cit.] were sown in field plots in different parts of Canada. In those kept free from weeds the percentage of affected kernels in the seed sown had some effect on percentage germination but little or none on the yield. Thus, seed treatment with fungicides to improve germination [see next abstract] also had little effect on yield. Experiments from 1947 to 1949 with practically disease-free seed indicate, however, that these results were due to compensation for low germination by an increased tillering of the surviving plants. Stimulating 'weediness' by sowing Argentine rape (*Brassica napa*) in the experimental plots prevented this compensation and the yield of grain from a plot was related to the number of plants in it. Seed treatment with fungicides increased germination under weedy conditions and often yield of all three crops (Regent wheat, Montcalm barley, and Garry oats, the last named in these trials being infected with *H. victoriae*). Treatment of fields with herbicides to eliminate weeds may, therefore, obviate the necessity for seed dressings against seedling blight fungi.

Henry (A. W. A.). **Chemical seed treatment for Canada's major grain crops.**—*Canad. Chem. Metall.*, 38, 4, p. 64, 1954.

In the course of this paper, read at the first annual meeting of the Canadian Agricultural Chemicals Association, Toronto, on 19th February, 1954, some figures are cited relating to the current use of chemicals in the treatment of cereal seed [see preceding abstract]. Most widely employed and commonly recommended for small grain disinfection are the organo-mercurials, which are applied (according to a 1953 seed-drill survey in Alberta) to some 58 per cent. of the wheat, oats, and barley seed sown in that province. For non-mercurials (other than formalin) and formalin the corresponding figures are 8 and 22 per cent., respectively.

Hansing (E. D.). **Seed treatment with new compared with older fungicides for control of Wheat, Oat, and Sorghum smut in Kansas, 1953.**—*Plant Dis. Reptr*, 38, 6, pp. 389–392, 1954. [Multilithed.]

In seed treatment trials on artificially infected Red Chief wheat, Kanota oats, and Red Kaffir sorghum at Kansas Agricultural Experiment Station, Manhattan

[cf. *R.A.M.*, 32, p. 548], higher dosages and prolonged storage of treated seed gave corresponding decreases in the incidence of wheat bunt (*Tilletia* spp.) [33, p. 527] for the volatile mercurials, panogen (concentrated or dilute at ¾ oz. per bush.), ceresan M, new improved ceresan, agrox, and setrete (each at ½ oz.), and mergamma (2 oz.), reducing infection to 1 per cent. or less with four days' storage as against 89 per cent. for the untreated. Vancide 51 (4 oz. or more) was the only satisfactory non-mercurial. Against oat smuts (*Ustilago avenae* and *U. kolleri*) [loc. cit.] panogen, new improved ceresan, and MEML (1 oz.), with the same storage period, were the most effective, reducing infection to 2 per cent. or less compared with 80 per cent. for the untreated. Sorghum kernel smut (*Sphacelotheca sorghi*) [33, p. 292], infecting 33 to 48 per cent. of the heads from untreated seed, was eliminated by concentrated panogen, new improved ceresan, agrox, and MEML at all dates of sowing, and by dilute panogen, ceresan M, MEMA (½ oz.), and helixin B (1 oz.), except when sown immediately following treatment.

Significant increases in emergence of Pawnee and Comanche wheat were obtained with vancide (4, 5, and 6 oz.), 5025–S (1 oz.), arasan, and spergon (both at 2 oz.) combined with a storage period of two weeks, and with panogen, vancide (2, 4, and 6), arasan, and spergon with storage for one and two years. The emergence of Combine and Midland sorghum treated with all the fungicides tested was better after all three storage periods. Vancide 51 is recommended for seed treatment for wheat and sorghum in Kansas.

Duff (A. D. S.). **A new disease of Wheat in Kenya caused by a species of Pyrenophora.**—*E. Afr. agric. J.*, 19, 4, pp. 225–229, 2 figs., 1954.

In Kenya in 1953–4 D.C. / Ceres R 64, a newly released, popular, premium-class wheat in general cropping on a commercial scale, became infected by *Pyrenophora tritici-repentis* [cf. *R.A.M.*, 14, p. 90; 20, p. 101; 33, p. 21]. Samples from many areas, grown from seed from different sources, were all infected, as were other commonly grown varieties from the same areas. The disease appears to be present throughout the wheat-growing regions of Kenya and to have been in the country for some time.

Under certain conditions R 64 can suffer a 75 per cent. reduction of yield, though at the same time other heavily infected crops of the same variety are almost unreduced. Samples of crops of 318 AJ, 294 M, 341, Cobbs 1066, and Sabanero had varying degrees of infection. None was severely damaged, pathological symptoms being confined to a few leaf lesions with perithecia. In laboratory tests Reliance was very susceptible, while Kenya Governor was almost immune from spore infection. Soil and weather conditions, particularly at planting time, appear to play an important part in determining whether or not a crop may be damaged; the evidence indicates that a very wet seed-bed may predispose to infection.

All the seed from an infected crop may be diseased, as the fungus is borne internally as well as externally. Control is recommended by seed treatment with an organo-mercurial dust.

Zogg (H.). **Methode zur laboratoriumsmäßigen Bestimmung der Fernwirkung von Getreidebeizmitteln.** [Methods for the laboratory assay of the action at a distance of cereal disinfectants.]—*Phytopath. Z.*, 22, 1, pp. 71–75, 2 figs., 1954. [English summary.]

The author describes a method in use at the Federal Agricultural Experiment Station, Zürich-Oerlikon, for the assay, under approximately natural conditions, of the action at a distance of chemical plant protectives on the spores of wheat bunt (*Tilletia tritici* [*T. caries*] and *T. brevifaciens* [*T. controversa*]). Unglazed clay pots 7 cm. in diameter are filled to between ¾ and ⅞ of their height with vermiculite (terralit) or some similar substance of good water-holding capacity, water being added

at a rate of 70 ml. per 100 ml. vermiculite and the rest of the pot (1·5 to 2 cm.) filled with air-dry soil passed through a fine-mesh sieve. The bunt spores are dusted over the surface through a fine hair sieve. Seeds treated with the chemicals to be tested are placed on the surface and kept for eight to ten days at 10° to 12° C. (for *T. caries*). To determine the fungicidal efficiency below the surface the seeds are planted at different depths and zones of inhibition provide direct evidence of the activity of the chemicals through the soil. A dark halo of ungerminated spores round the seed indicates the zone over which the fungicide is effective.

STRAND (E.). **Resistensforedling av korn. Rotråtesykdommene kornprodusentenes fiende nr. 1.** [Breeding cereals for resistance. Root rot diseases are cereal-growers' enemies No. 1.]—*Norsk Landbr.*, 20, 6, pp. 118–121, 1954.

Very little systematic work on breeding cereals for resistance to disease has yet been accomplished in Norway. Six physiologic races of *Erysiphe graminis* [*R.A.M.*, 29, p. 254] have been differentiated on wheat, most of which also occur in Germany [19, p. 205; 33, p. 23], but are evidently distinct from those of the United States and Canada. During the period from 1946 to 1953 the summer wheat harvests were only 71 per cent. of those of barley, as compared with 80 to 85 per cent. in former years, a figure which is still maintained in mildew-free localities.

Work on the breeding of barley and wheat for resistance to loose smuts [*Ustilago nuda* and *U. tritici*, respectively] was initiated in 1950. Although their average incidence does not exceed 1 per cent., corresponding to two or three infected plants per sq. m., it entails an annual loss of Kr. 1,500,000 to 2,000,000. So far, out of about 150 Scandinavian and foreign barley varieties and 183 wheats, none of the Scandinavian barleys and only four of the foreign are resistant to all physiologic races of *U. nuda*. Not more than one, or possibly two, are suitable for use as parental material. More sources of resistance to *U. tritici* were found, especially among Swedish wheat varieties.

Breeding for resistance to the root rot complex (*Ophiobolus graminis*, *Cercosporella herpotrichoides* [C.M.I. map No. 74], and species of *Helminthosporium* and *Fusarium*), the most important disease of wheat and barley in Norway today, presents a difficult problem to which no systematic approach has yet been made. Pending further studies the pathogens should be held in check by crop rotation and cultural practices.

BOOSALIS (M. G.). **Hessian fly in relation to the development of crown and basal stem rot of Wheat.**—*Phytopathology*, 44, 5, pp. 224–229, 2 figs., 1954.

The recent increase in the infestation of wheat by *Phytophaga destructor* in Nebraska was shown to be correlated with a corresponding rise in the incidence of crown and basal stem rot, associated predominantly with *Helminthosporium* and *Fusarium* spp. The syndrome of plants jointly attacked by *P. destructor* and fungi was similar to that of those infected by the latter alone.

GROSSMANN (F.). **Das saprophytische und parasitische Wachstum von Ophiobolus graminis Sacc. unter dem Einfluss verschiedener Fruchtfolgepflanzen und -maßnahmen.** [The saprophytic and parasitic growth of *Ophiobolus graminis* Sacc. under the influence of various crop rotation plants and practices.]—*Phytopath. Z.*, 22, 1, pp. 35–70, 1954.

At the Institute for Plant Protection, Stuttgart-Hohenheim, Germany, the addition to biomalt agar cultures of *Ophiobolus graminis*, the agent of foot rot of wheat [*R.A.M.*, 33, p. 617], of triturated plant material (especially legumes at 2 gm. per Petri dish) exerted a marked inhibitory effect on the development of the fungus. Thus, red clover and 'yellow clover' suppressed growth completely, while other

species reduced it by 10 to 30 per cent., blue lupins (bitter and sweet) being the most efficient and vetches [*Vicia* spp.] the least, with peas and broad (field) beans in an intermediate position. Oats caused total inhibition but barley, maize, winter and summer rape, and mustard were virtually without effect. However, when mechanically sterilized, aqueous extracts of the plants were added to a nutrient solution, they almost invariably stimulated the growth of the fungus, only 'yellow clover' continuing to depress it.

Plant pieces 0·5 cm. long, mixed (at 1 per cent. by weight) with a clay and sand soil, exerted a variable effect on the parasitic and saprophytic development of *O. graminis*, though a general inhibitory tendency prevailed. When they were applied as a green manure to pots and field plots the depressing influence of the plants (except peas and lupins) was much more pronounced, particularly on the saprophytic phase of the fungus. On the other hand, crop residues were more or less ineffectual in the suppression of the pathogen in the soil.

Of the four possible explanations of the relation between crop rotation practices and the saprophytic development, only one is regarded as acceptable, namely, that appropriate rotations act primarily by the stimulation of micro-organisms, which effectively reduce the numbers of parasitic competitors. There is a bibliography of 47 titles.

Arya (H. C.) & Ghemawat (M. S.). **Occurrence of powdery mildew of Wheat in the neighbourhood of Jodhpur.**—*Indian Phytopath.*, 6 (*1953*), 2, pp. 123–130, 4 figs., 1954.

Every year wheat in the neighbourhood of Jodhpur, India, is attacked by powdery mildew (*Erysiphe graminis*). Heavy damage was incurred in March, 1952. Although cleistothecia containing asci were found in limited numbers when the crop was maturing no ascospores were observed. Ascospore formation was induced in the laboratory of Jaswant College, Jodhpur, by subjecting cleistothecia to temperatures of 5° and 9° C. for eight hours following 48 and 24 hours, respectively, at room temperature; by exposure to 2, 10, and 25 per cent. sucrose concentrations for 120, 24, and 17 hours, respectively; to nitric acid (eight drops in 5 ml. water) for 144 hours; or to 25 per cent. potassium nitrate solution for 168 hours.

Maximum conidial germination occurred at 100 per cent. relative humidity; none took place below 92·9 per cent. or at temperatures above 32°. In field inoculation experiments no infection occurred when the prevailing minimum and maximum temperatures were 78° and 104° F., respectively, or unless there had been a minimum of six hours of saturated, humid conditions. The disease was most severe from the beginning of March. Viability was lost from May onwards. The host range was strictly specialized.

The authors conclude that the cleistothecia are probably functionless and that the crops are reinfected annually by wind-borne conidia, possibly originating from the Himalayas [cf. *R.A.M.*, 10, p. 173].

Futrell (M. C.) & Dickson (J. G.). **The influence of temperature on the development of powdery mildew on spring Wheats.**—*Phytopathology*, 44, 5, pp. 247–251, 2 figs., 1954.

This is an expanded account of studies at Wisconsin Agricultural Experiment Station on the relation of temperature to the pathogenicity of *Erysiphe graminis* on wheat [see following abstracts], a preliminary note on which has already appeared [*R.A.M.*, 33, p. 76].

Ray (D. A.), Hebert (T. T.), & Middleton (G. K.). **Inheritance of resistance to powdery mildew in Wheat.**—*Agron. J.*, 46, 8, pp. 379–383, 1954.

At North Carolina Agricultural Experiment Station 11 wheat crosses were studied

in the F_2 generation for the inheritance of mature-plant resistance to spontaneous field infection by *Erysiphe graminis* [see preceding and next abstracts]. Ten of the crosses were examined for the segregation of seedling resistance to four races of the fungus in the greenhouse [*R.A.M.*, 33, p. 76]. The F_3 progeny of each F_2 plant from one cross was classified in the field and the F_4 in the greenhouse.

Seedling resistance of Suwon 92 to collections 3, 10, 46, and 70 was apparently conditioned by single dominant factors in crosses with Atlas 50 and Hardired. Suwon 92 and Normandie segregated for a two-factor difference for seedling resistance to collections 3, 46, and 70 and for a single major factor for seedling resistance to collection 10. Segregation from the cross between Axminster and Chul conformed to expectation, assuming seedling resistance to collections 10, 46, and 70 to be conditioned by single dominant factors, and a two major factor difference was exhibited for seedling resistance to collection 3 and mature-plant resistance in the field.

Axminster shares at least one factor with Norka, Normandie, and Huron for seedling resistance to each of collections 3, 46, and 70 and for mature-plant resistance in the field. The identical major factor for seedling resistance to collection 46 appeared to be common to Axminster, Norka, and Huron, while an additional major factor controlling seedling resistance to collection 70 is carried by the same three varieties. Normandie and Suwon 92 share at least one factor for mature-plant resistance.

All the single major factors for seedling resistance seem to be closely linked in each of the resistant varieties studied with the exception of the Chul factor for resistance to collection 10. The Suwon 92 factor for resistance to collection 46 may be identical with that for resistance to collection 70.

The genes determining the expression of glume pubescence appeared to be closely associated with the major factor for seedling resistance to collection 46 in Suwon 92.

Allard (R. W.) & Shands (R. G.). **Inheritance of resistance to stem rust and powdery mildew in cytologically stable spring Wheats derived from Triticum timopheevi.**—*Phytopathology*, 44, 5, pp. 266–274, 1954.

Two hard red spring wheat selections, C.I. 12632 and C.I. 12633, were derived from the hybrid between a common hard spring red wheat, 2666A2–2–15–6–3 (produced at Wisconsin Agricultural Experiment Station from the cross Illinois No. 1 × Chinese C.I. 6223), and *Triticum timopheevi* [*R.A.M.*, 20, p. 565] by two generations of back-crossing to the wheat parent and eight of selfing. These two cytologically stable selections possess a high degree of mature-plant resistance to stem and leaf rusts (*Puccinia graminis* and *P. rubigo-vera tritici* [*P. triticina*]) and mildew (*Erysiphe graminis*) [28, p. 449 and preceding abstracts]. C.I. 12633, moreover, is highly resistant to loose smut [*Ustilago tritici*]. The investigations herein reported were carried out at Davis, California, and Madison, Wisconsin.

The stem rust resistance of the two selections of hybrids with Reward and Marquis is controlled by dominant duplicate genes linked with a recombination value of 14·78±1·75 per cent. Mature-plant resistance to *P. graminis* was so closely associated with that to *E. graminis* that no unquestionable recombinations occurred in 762 F_3 progenies. Besides the genes governing mature-plant response to mildew, C.I. 12632 and C.I. 12633 carry a dominant allele for necrotic reaction to the disease which appreciably influences infection of the first seedling leaf and to a lesser degree that of the later leaves, as well as one or more other genes affecting response to *E. graminis*.

It would appear that the two selections are promising sources of resistance to stem and leaf rusts and mildew, while C.I. 12633 may also be of value in the development of resistance to loose smut.

JOHNSON (T.) & GREEN (G. J.). **Resistance of common Barberry (Berberis vulgaris L.) to race 15B of Wheat stem rust.**—*Canad. J. Bot.*, 32, 3, pp. 378–379, 1 pl., 1954.

During 1953, 24 plants of common barberry were inoculated in the Plant Pathology Laboratory, Winnipeg, with sporidia derived from several collections of race 15B of *Puccinia graminis tritici* [*R.A.M.*, 31, p. 486] obtained from various parts of Canada.

The plants were highly resistant, only five small aecidial pustules being produced, while all other infections were limited to small necrotic spots or minute pycnial pustules. One of the aecidial pustules gave rise to a uredial culture of race 9, another to race 11, a third to race 15B similar to the isolates used as inoculum, and a fourth to a culture of 15B weak in uredospore production.

KRITZINGER (A.). **The breeding of rust resistant Wheat varieties.**—*Fmg in S. Afr.*, 29, 338, pp. 267–268, 8 figs., 1954.

The author traces the advances made in breeding for resistance to wheat stem and leaf rust [*Puccinia graminis* and *P. triticina*] in South Africa [*R.A.M.*, 33, p. 657] since 1912 and states that the latest successful development is the wheat × *Agropyron* [32, p. 73] breeding project initiated in 1950. During 1953, however, a few crosses were made between standard bread wheat varieties and *Aegilops*, which is also highly resistant to both rusts. Rye lines have been so seriously attacked by new races of leaf rust that they are no longer of any use as sources of resistance.

SHUKLA (T. N.). **Factors affecting variability in cereal rust reactions. I. Variability caused by temperature.**—*Indian Phytopath.*, 6 (*1953*), 2, pp. 67–79, 1 fig., 1954.

In the Laboratory of the Plant Pathologist to the Government, Kanpur, U[ttar] P[radesh], the reactions of a number of wheat varieties to races 15 and 15B of *Puccinia graminis tritici* were found to be stable under different environmental conditions in which temperature was the principal variable. Thus, Mida, Marquis, Mindum, and Stewart were susceptible at 60° to 98° F. with high or low light intensities; Lee was resistant to race 15 and susceptible to 15B in all the environments tested, and Frontana was moderately susceptible to both races under all conditions. Kenya 58 and Kenya 117A, however, were highly resistant to 15B at constant moderate and low temperatures with low light intensity and moderately susceptible at temperatures above 82° with either high or low light intensity, with gradations in reaction under intermediate conditions [cf. next abstract]. On the basis of these results these two varieties are expected to be resistant in cool growing seasons and moderately so in warm ones.

VASUDEVA (R. S.), LELE (V. C.), & MISRA (D. P.). **A new physiologic race of Puccinia graminis tritici (Pers.) Erikss. and Henn. in India.**—*Indian Phytopath.*, 6 (*1953*), 2, p. 141, 1954.

A collection of black rust (*Puccinia graminis*) from the 1952–3 Rabi wheat crop in southern India included a new race, similar to race 72 and differing from all other known Indian races [*R.A.M.*, 33, p. 710, and preceding abstract] in that Arnautka, Mindum, and Spelmar were resistant to it. Little Club reacted by type-X infection, showing considerable resistance at high temperatures and moderate susceptibility at low.

JOHNSON (T.) & GREEN (G. J.). **The production by Puccinia graminis of abortive pycnia on Wheat.**—*Canad. J. agric. Sci.*, 34, 3, pp. 313–315, 1 pl., 1954.

In infection experiments at the Plant Pathology Laboratory, Winnipeg, Manitoba, with a culture of race 59 of *Puccinia graminis*, involving the infection of

barberry (*Berberis vulgaris*) and the subsequent inoculation of wheat seedlings with the aecidiospores, there was a tendency in this culture (but not in two others) of race 59 to produce abortive pycnia on wheat. Paraphyses and a scanty exudate but no pycniospores were developed in the pycnia.

Hassebrauk (K.). **Zur physiologischen Spezialisierung von Puccinia triticina Erikss. in der Deutschen Bundesrepublik im Jahre 1952.** [On the physiologic specialization of *Puccinia triticina* Erikss. in the German Federal Republic in the year 1952.]—*Z. PflZücht.*, 33, 3, pp. 354–356, 1954.

During 1952 the physiologic races of wheat brown rust (*Puccinia triticina*) isolated from 133 samples collected in widely separated areas of the Federal German Republic [*R.A.M.*, 33, p. 473] were identified as 1 (= UN 1), which was by far the most prevalent, 4 (= UN 4), 11 (= UN 10), 17 (= UN 11), 18 (= UN 12), 43 (= UN 14), 53 (= UN 1), 93 (= UN 11), 124 (= UN 23), and a new one from Münster, Westphalia, differing from 18 only in the grade of infection (0) which it induces on the differential variety Webster.

Yellow rust of Wheat in England and Wales, 1953.—*Plant Path.*, 3, 1, pp. 33–34, 1954.

In 1953 the Plant Disease Survey showed that wheat yellow rust (*Puccinia glumarum*) [*R.A.M.*, 33, p. 204] did not appear in most parts of England and Wales until July, and infection was mostly slight. A few severe attacks occurred on Nord Desprez in the east and south-east and on Pilot in Northumberland.

Information supplied by Dr. C. C. V. Batts records that race 8 was present in all parts and race 2 and biotype 2B [loc. cit.] in the south and in parts of the Midlands, biotype 2B being found as far north as Lincolnshire and Worcestershire.

Conners (I. L.). **The organism causing dwarf bunt of Wheat.**—*Canad. J. Bot.*, 32, 3, pp. 426–431, 1 pl., 1954.

In the Department of Agriculture, Ottawa, a study of the species of *Tilletia* attacking wheat demonstrated that the dwarf bunt fungus, *Tilletia brevifaciens* [*R.A.M.*, 31, p. 378; 32, p. 426; 33, p. 531], is not specifically distinct from *T. contraversa* on *Agropyron repens* and other *A.* spp. [26, p. 173]. Dwarf bunt probably first developed on wheat in the mountainous areas of Europe where indigenous species of *Agropyron* are infected naturally by *T. contraversa* [*T. controversa*]. It may have been introduced into North America on wheat or on one of the species of *Agropyron* now cultivated.

Berend (I.). **Examen des facteurs externes ayant une influence sur la germination des spores de Tilletia foetida.** [Study of the external factors influencing the spore germination of *Tilletia foetida*.]—*Kiadván. Növényvéd. Kutató Intéz.*, 2, pp. 56–90, 1952. [Hungarian, with Russian and French summaries. Abs. in *Z. PflKrankh.*, 61, 8, p. 407, 1954.]

Spores of wheat bunt (*Tilletia foetida*) collected in Hungary [see next abstract] 4½ and 12 years previously, when exposed to a temperature of −28° C. for 50 hours and to one of −47° for 24 to 40, germinated 50 to 54 per cent. compared with 0·3 per cent. for untreated spores. Four-, five-, seven-, and ten-year-old collections subjected to ultrasonic vibrations (800 and 1,600 kHz for five and ten minutes) germinated actively to the extent of 25 to 30 per cent. on the fifth day, whereas only 10 to 15 per cent. delayed germination occurred in the controls. A slight, transient stimulus to germination was further exerted by 1 per cent. hydrogen peroxide, 0·25 and 0·5 per cent. potassium permanganate, 0·1 per cent. nitric acid, oxalic acid, and methylene blue, and 0·001 per cent. eosin and

trypaflavine. When three- to seven-year-old bunt balls and spores, dry and moist, were exposed in glass vials at a distance of 40 cm. to X-rays 500, 800, 1,000, and 3,000 röntgens active germination was observed after three to four days, especially in the five- to seven-year-old lots irradiated at 1,000 r.

Podhradszky (J.). **Die Verbreitung der den Steinbrand des Weizens erregende Tilletia-Arten in Ungarn.** [The distribution in Hungary of the *Tilletia* species causing Wheat bunt.]—*Jb. ung. Forschungsinst. PflSch.*, 6 (*1951*), pp. 184–203, 1953. [Hungarian, with Russian and German summaries. Abs. in *PflKrankh.*, 61, 8, p. 407, 1954.]

Some 5,000 ears of wheat from 562 Hungarian communities examined in 1949 yielded *Tilletia foetida* [see preceding abstract], *T. triticoides*, and *T. caries*; *T. intermedia* [*R.A.M.*, 31, p. 323] was isolated only once. Both *T. triticoides* [32, p. 673] and *T. caries* are responsible for important damage in the heavy-rainfall regions of the west, south-west, and north-east, and also occur in small proportions (5·4 and 0·4 per cent., respectively) in relatively humid mountain areas.

Gassner (G.) & Niemann (E.). **Untersuchungen über die Temperatur- und Lichtabhängigkeit der Sporenkeimung verschiedener Tilletia-Arten.** [Studies on the dependence on temperature and light of spore germination in various *Tilletia* species.]—*Phytopath. Z.*, 21, 4, pp. 367–394, 1 fig., 15 graphs, 1954.

At the Technical Institute, Brunswick, the minimum, optimum, and maximum temperatures for the germination of spores of wheat dwarf bunt (*Tilletia brevifaciens*) [*T. controversa*: see above p. 29] and rye bunt (*T. secalis*) [*R.A.M.*, 30, p. 408 and next abstract] were $< 2°$, 3° to 5°, and about 10° C., respectively, the corresponding figures for wheat bunt (*T. caries*) being $< 2°$, approximately 5°, and $> 24°$ [33, p. 223]. Daily exposure for nine hours to a temperature of 24° totally inhibited the germination of *T. controversa* and *T. secalis*, whereas one of −5°, operating every fourth day, merely delayed the process. In all three species germination was promoted by light [loc. cit.]. Sporidial production by *T. controversa* and *T. secalis* may occur even in total darkness provided they have received adequate illumination during the earlier stages of germination. In general, *T. secalis* occupies an intermediate position between *T. controversa* and *T. caries*, somewhat nearer the former species, with regard to the physiology of germination.

Gassner (G.) & Niemann (E.). **Über die Infektion von Weizen und Roggen durch verschiedene Tilletia-Arten.** [On the infection of Wheat and Rye by various *Tilletia* species.]—*Phytopath. Z.*, 22, 1, pp. 109–124, 1 graph, 1954.

Most of the 27 papers cited in the bibliography appended to the authors' report of further studies on *Tilletia caries*, *T. brevifaciens* [*T. controversa*], and *T. secalis* [see preceding abstract] have been noticed from time to time in this *Review*. In one year's (1952–3) inoculation experiments on Carsten V and General von Stocken winter and v. Rümkers Sommerdickkopf summer wheat *T. caries* proved to be transmissible through the seed and soil, as well as by direct infection of the seedlings, whereas only the last-named method was successful with *T. brevifaciens* on wheat and *T. secalis* on Petkuser Normalstroh and Tetra rye. In pot experiments wheat seedlings were susceptible to the wheat bunts only until they reached a height of at most 20 mm., the heaviest infection occurring at 2 mm. *T. caries* was most virulent on plants kept at a temperature of 12° C. for some time after inoculation, the average percentages of infection transmitted through seed (at $2\frac{1}{2}$ weeks) and soil (one week) and by direct application of sporidia to the seedlings (one week) being 71, 61, and 81, respectively. The corresponding figures for seed transmission at 5° (five weeks) and 2° (eight weeks) were 47 and 6, respectively; for soil transmission

at 5° (two weeks) and 2° (four weeks) 36 and 24, respectively; and for seedling inoculation at 5° (two weeks) and 2° (three weeks) 62 and 52, respectively. On the other hand, seedling infection by *T. controversa* and *T. secalis* was heaviest at the minimum temperature of 2°, averaging 12·5 and 41 per cent., respectively, after three weeks, the corresponding figures at 5° (three weeks for the former and two for the latter species) being 3·7 and 30, respectively, and at 12° (one week) 1·2 and 4, respectively. Under favourable conditions for infection *T. controversa* was found to be transmissible to winter wheat, inoculated and sown in the spring (May), as well as to summer wheat.

On the basis of these results a method is described for the performance of inoculation experiments with *T. controversa* and *T. secalis* to ensure positive results irrespective of seasonal factors. Sporidia pre-germinated by culture at a low temperature in the light or with the addition of chemicals [loc. cit.] are used on seedlings about 2 or at the most 5 mm. in length, which are then left for some weeks at temperatures round about 2° before transplanting in the field.

Levine (M. N.) & Cherewick (W. J.). **Studies on dwarf leaf rust of Barley.**—*Tech. Bull. U.S. Dep. Agric.* 1056, 17 pp., 1952.

Nine varieties of barley, namely, Speciale, Rekal, Sudan, Bolivia, Oderbrucker, Quinn, Egypt 4, Gold, and Lechtaler, were found to be critical for the identification of the different physiologic races of barley leaf rust, *Puccinia hordei* [*R.A.M.*, 32, p. 542]. Keys, constructed with the aid of these differentials and information from the literature (28 titles), are given for all the known races, together with results of inoculation tests. The races so far known have been reduced to 52, while those identified in N. America have been consolidated into 26 all bearing unified numerations prefixed by UN.

Race 4, present in 29·7 per cent. of the collections, was the most widely distributed; races 37 and 47 were next in the United States and 2 and 35 in Canada. Eleven races were common to both countries, but only three of the N. American races occur outside N. America, race 3 in Australia and 11 and 16 in Europe. The aecidial stage of *P. hordei* has not been found in N. America. In the laboratory pathogenic mutations were quite frequent, so this would seem to explain the origin of the races in this continent.

Simons (M. D.). **The relationship of temperature and stage of growth to the crown rust reaction of certain varieties of Oats.**—*Phytopathology*, 44, 5, pp. 221–223, 1954.

At Iowa Agricultural Experiment Station 11 varieties of oats were inoculated at the seedling, juvenile, boot, and anthesis stages with race 205 (an atypical biotype of the old race 45) of crown rust (*Puccinia coronata*) [*R.A.M.*, 32, p. 371; 33, pp. 475, 665]. One lot was incubated at 15° and another at 25° C. With the exception of Victoria, varieties of differing reaction were more resistant at the lower temperature and in the later stages of growth. Some varieties, e.g. Markton, reacted similarly at both temperatures and in all phases of development. Mo. 0–205, completely susceptible in the seedling stage, developed a very high degree of mature-plant resistance at both temperatures. At 15° Appler, Marion, and Cherokee, also susceptible as seedlings, exhibited moderate resistance at maturity, but at 25° they contracted infection in all phases. Santa Fe (not inoculated at anthesis), Bondvic, Clintafe, and Clintland were uniformly highly resistant at the various growth stages. The strong resistance of Landhafer at 15° broke down sufficiently at 25° to exclude it from the highly resistant group.

Teleutosori were produced more copiously at the higher temperature on all but the most susceptible varieties. Growth stages exerted little or no effect on the

process at 15°, but at 25° production was more abundant in the juvenile stage than at the boot or anthesis.

Boewe (G. H.). **Stewart's disease prospects in Illinois for 1954.**—*Plant Dis. Reptr*, 38, 6, p. 388, 1 map, 1954. [Multilithed.]

According to the annual forecast made by the Illinois State Natural History Survey, Urbana, Stewart's disease (*Bacterium* [*Xanthomonas*] *stewarti*) of maize [*R.A.M.*, 32, p. 676] was expected to occur throughout the State in 1954 and to be more destructive than in 1953. The early season wilt was forecast to be absent or nearly so in the extreme north, light in the north, light or severe in the central region, and destructive in the south, the late season leaf blight for the corresponding areas being light or moderate, moderate or severe, severe, and severe, respectively.

Orillo (F. T.). **Leaf spot of Maize caused by Helminthosporium maydis.**—*Philipp. Agric.*, 36, 7–8, pp. 327–386, 3 pl., 6 graphs, 1952–53. [Received 1954.]

This exhaustive study on the maize leaf spot pathogen, *Cochliobolus heterostrophus*, carried out at the Cryptogamic Laboratories, Harvard University, and the University of the Philippines, was directed at providing a basis for more effective control methods in view of the widespread occurrence and dangerous potentialities of the disease, which affects up to 90 per cent. of the crop in some countries and occurs in epiphytotic proportions in others. In the Philippines it becomes serious on some varieties under favourable conditions. Plants are attacked at all stages of development.

The fungus grew and sporulated well on a variety of natural agar media and plant tissues, and grew well but sporulated sparingly in Richards' and Czapek's solutions. To some extent it was capable of destroying cellulose. It grew at temperatures varying from 10° to 40° C., the optimum being 24° to 30°, and at pH 2·2 to 11·2 (optimum 5·8 to 6·4). The thermal death point of the conidia was 52°. Penetration occurred through the stomata, through injuries, or directly through the uninjured epidermis, the germ tubes forming appressoria. Proliferation of the intracellular hyphae caused disorganization of the contents and the shrinking and discoloration of the walls of the mesophyll cells. Mycelium remained viable for 20 months within the host tissues mixed with dry soil in the greenhouse, and for ten months mixed with moistened soil. Conidia lost their viability after storage for 26 months in glass jars in the laboratory. They are dispersed primarily by wind, but also by rain and insects.

In greenhouse spraying experiments 1:500 Bordeaux mixture and 1:200 semesan gave complete protection with no deleterious action on the plants. Other measures to reduce the disease, if not to eliminate it, are the removal of infected debris, destruction of probable wild hosts [cf. *R.A.M.*, 29, p. 299], and planting of resistant varieties [32, p. 178; 33, p. 217].

Whitney (N. J.). **Ear rots in hybrid Corn in Essex County, Ontario, in relation to damage by birds.**—*Plant Dis. Reptr*, 38, 6, pp. 384–387, 4 figs., 1954. [Multilithed.]

Observations made in 1952 in various localities in Essex County, Ontario, Canada, indicated that bird damage predisposes maize to infection by ear-rotting fungi, of which the most prevalent were *Gibberella fujikuroi*, followed by *Diplodia zeae* and *G. zeae* [*R.A.M.*, 32, p. 479; cf. 33, p. 79]. Of 2,528 damaged ears examined 570 (22·5 per cent.) were diseased compared with 13 (0·8 per cent.) of the 1,640 undamaged.

Ciccarone (A.) & Malaguti (G.). **Notas sobre la biología y control del carbón del Sorgo (Sphacelotheca sorghi (Lk.) Clinton) en Venezuela.** [Notes on the biology and control of Sorghum smut (*Sphacelotheca sorghi* (Lk.) Clinton) in Venezuela.] —*Bol. téc. Inst. Agric. Maracay* 6, 42 pp., 2 figs., 5 graphs, 1952. [English summary. Received December, 1953.]

This information has already been noticed from another source [*R.A.M.*, 30, p. 564].

Chapman (H. D.). **Studies on the nutrition of Citrus.**—*Rep. Int. hort. Congr.*, 13 (*1952*), pp. 1241–1256, 1953. [French summary.]

Tables summarizing the growth, appearance, and fruit characteristics of citrus trees affected by various mineral deficiencies [*R.A.M.*, 32, p. 312] and excesses are presented, including leaf analysis standards for their diagnosis. Typical iron deficiency [33, p. 152] symptoms, all remediable by iron sprays, have been produced by low soil temperatures, slight excess of zinc in the culture medium, acute magnesium or potassium deficiency, excess magnesium or sodium bicarbonate, and excess water in the soil.

Scrivani (P.). **Patogenesi, riproduzione sperimentale del mal secco da Deuterophoma tracheiphila Petri e ricerche sulla formazione di metaboliti tossici in cultura.** [Pathogenesis, experimental reproduction of the mal secco of *Deuterophoma tracheiphila* Petri and studies on the formation of toxic metabolites in culture.]—*Phytopath. Z.*, 22, 1, pp. 83–108, 5 figs., 1954. [German and English summaries.]

From 1950 to 1953 at an experimental laboratory of the Montecatini Society, Florence, the pathogenicity of several strains of *Deuterophoma tracheiphila* from different parts of Italy [*R.A.M.*, 33, p. 669] was compared by means of root and stem inoculations of young bitter orange plants. Out of a total of 130, over 60 contracted the disease, as also did two out of 27 uninoculated controls [cf. loc. cit.].

Using improved methods and specially virulent strains, up to 100 per cent. infection was obtained. When the fungus spreads upwards from the base of the plant the symptoms do not appear until it reaches the top. Only one of the isolates tested was avirulent, DP from Sicily, which does not secrete a red pigment [33, p. 535]. No toxic effects on the host were produced by the pigment, but metabolites elaborated by the fungus in liquid cultures were pathogenic to seedlings of tomato (used as a sensitive but non-specific test plant), lemon, and bitter orange (both specific but less sensitive). The best medium for toxin production consisted of 0·5 gm. each of potassium chloride and magnesium sulphate, 1 gm. dibasic potassium phosphate, 2 gm. sodium nitrate, 0·01 gm. ferrous sulphate, 20 gm. glucose, 90 ml. maize extract, and water to make up to 1,000 ml. Crude culture filtrates yielded a toxic fraction partially thermostable at 100° C. and resistant to ultra-filtration, but inactivated by protracted storage at 2° to 5°.

Benton (R. J.), Bowman (F. T.), Fraser (Lilian), & Kebby (R. G.). **The significance of Poncirus trifoliata for Citrus rootstock problems.**—*Rep. Int. hort. Congr.*, 13 (*1952*), pp. 1235–1240, 2 pl., 1953. [French summary.]

The citrus rootstock most resistant to *Phytophthora citrophthora* is *Poncirus trifoliata*, which has been subjected to intensive investigations in New South Wales [*R.A.M.*, 30, p. 310]. The limiting factor to the use of this tree as a rootstock has been scaly butt [29, p. 506], now shown to be a virus disease, and controlled by the use of virus-free budwood. Scaly butt virus is not related to psorosis or tristeza, and has no known vector.

Reichert (I.). **Xyloporosis in Citrus.**—*Rep. Int. hort. Congr.*, 13 (*1952*), pp. 1275–1280, 1953. [French summary.]

Observations on the occurrence of xyloporosis in Israel [*R.A.M.*, 33, p. 347] on various varieties of sweet oranges, sweet lime, grapefruit, mandarin, rough lemon, sour lime, and *Poncirus trifoliata*, and of little leaf disease on sour orange [loc. cit.], suggest that they are identical. Reasons for considering xyloporosis as different from the tristeza group of citrus virus diseases [32, p. 18] are the production of asymmetrical fruits, the mild nature of the disease on sour orange, and the susceptibility of sweet orange and Shamouti combinations with mandarin scions and *P. trifoliata* stock.

Sanders (F. R.). **Nineteenth Annual Report of the Coffee Research and Experimental Station, Lyamungu, Moshi, 1952.**—36 pp., 1954.

In this report from Tanganyika [cf. *R.A.M.*, 32, p. 117] it is stated that *Hemileia vastatrix* [24, p. 8] was severe during the early part of the year before perenox sprays were applied, but was controlled during July and August by post-monsoon spraying. Further investigations on the incidence and causes of wither (or black) tip and die-back of coffee in the Mbosi district, revealed that wither tip, which occurs in October–November at the time of flowering, is not necessarily followed by die-back and that this disorder occurs at two periods, i.e., just before the September–October rains with no leaf fall and immediately following the rains when leaf fall does occur. Analyses revealed that there is calcium deficiency and excess manganese in Mbosi soils. Coffee leaves are low in calcium and possibly boron and high in manganese, which suggests that the disorder may be manganese-induced calcium deficiency with boron also involved.

Perez S. (V. M.). **Ensayos realizados en el combate del ojo de gallo con fungicidas a base de cobre.** [Experiments conducted on the control of cock's eye with copper-based fungicides.]—*Suelo tico*, 7, 30, pp. 177–187, 3 figs., 1954.

Spraying experiments with copper-based fungicides conducted from 1951 to 1952 for the control of *Mycena citricolor* [*R.A.M.*, 33, p. 351] on coffee trees in various parts of Costa Rica [31, p. 183] demonstrated the efficiency of perenox (2 lb. in 100 gals. water) and tribasic copper (4–100) applied at 30-day intervals and crag 658 (2–100) at 15-day intervals. No copper toxicity occurred at 30-day intervals. The stickers triton (4 oz.–100 gals.) and filmfast (8–100) both gave good results. The fungicides also combated other diseases such as thread blight (*Pellicularia* [*Corticium*] *koleroga*) [31, p. 374] and *C. salmonicolor*. None, however, was successful unless the leaves were sprayed thoroughly on both sides and unless conditions, such as shade and drainage, were unfavourable to fungus development.

Further experiments were conducted in 1953 to confirm these results and determine the minimum concentrations required to control *M. citricolor* and *C. koleroga*. These were, for the former, 2 lb. perenox or 4 lb. tribasic copper, or 3 lb. crag 658, in 100 gals. water but the last material was more expensive to use. Cupravit appeared promising and is to be tested again. *C. koleroga* was controlled by 2 and 4 lb. perenox and by tribasic copper.

From these results it is concluded that the degree of control obtained completely justifies the cost involved (450,000 to 500,000 cols. for 12,000 plants receiving seven sprays from a knapsack sprayer during the wet months of May to November).

Bollenbacher (Katharina) & Marsh (P. B.). **A preliminary note on a fluorescent-fibre condition in raw Cotton.**—*Plant Dis. Reptr*, 38, 6, pp. 375–379, 1954. [Multilithed.]

Samples of raw cotton from the 1953 crop at Blythe, California, bore yellowish

spots which became brightly fluorescent in ultra-violet light. Several varieties were affected, the stain appearing in August on rank cotton about six feet tall and being confined to the lower bolls that had just started to open. Fifty per cent. of the bales harvested on one 1,000-acre farm were spotted. A similar condition was observed at Yuma, Arizona, and in samples from Arkansas and Texas.

Among the fungi commonly isolated from the fluorescent fibres were *Aspergillus niger* [*R.A.M.*, 26, p. 152] and *Rhizopus nigricans* [*R. stolonifer*: loc. cit.; cf. 33, p. 357]. *A. flavus* [cf. 33, p. 674], not before noted frequently on raw cotton, was isolated regularly and produced typical fluorescence when inoculated on locks from unopened bolls.

Prota (U.). **Prima segnalazione in Italia (Sardegna) dell'avvizzimento del Cotone da Verticillium dahliae Kleb.** [First report in Italy (Sardinia) of wilt of Cotton caused by *Verticillium dahliae* Kleb.]—*Notiz. Malatt. Piante, 1953*, 27(N.S.6), pp. 33–36, 6 figs., 1954.

In August, 1953, Acala cotton growing in an experimental plot at Sassari, Sardinia, was found to be affected by *Verticillium dahliae*, not before recorded in Italy. Plants of the Pima variety (*Gossypium barbadense*) growing in an adjoining plot were unaffected [cf. *R.A.M.*, 11, p. 514]. Tomato plants on adjacent land had wilted before setting fruits and it is thought that this wilt may, possibly, have been due to *V. dahliae*. That infection was soil-borne was suggested by the fact that both cotton varieties when grown at Mamuntanas, 25 km. away, from seed from the same source, remained unaffected.

Efimov (A. L.) & Mushnikova (Mme K. N.). Новый перспективный препарат для протравливания семян Хлопчатника против гоммоза. [Possible new preparation for disinfecting Cotton seeds against gummosis.]—Земледелие [*Zemledelie, Moscow*], 2, 4, pp. 104–106, 1954.

In tests in various parts of the U.S.S.R. 20 per cent. copper trichlorophenolate (8 kg. per t[on] of seed) and granosan (6 kg.) were effective against cotton gummosis [blackarm: *Xanthomonas malvacearum*: *R.A.M.*, 32, p. 556]. The infection on various farms was reduced from 39·4 and 46·2 to 0·3 and 0·2, respectively, for the two preparations, compared with a range of 2·7 to 64 for formalin treatment. They reduced [unspecified] root rot from a range of 2·9 to 16·3 per cent. (controls) to a range of 0 and 0·1 to 2·5 and 4·4, respectively. Both increased yield: 20 per cent. copper trichlorophenolate at the rate used did not affect germination, which was, however, depressed when the concentration was increased to 10 kg. per ton of seed.

Baque (D. G.). **The performance of five varieties of Kenaf.**—*Philipp. Agric.*, 37, 3, pp. 130–141, 2 figs., 1953. [Received September, 1954.]

Studies on the performance of the kenaf (*Hibiscus cannabinus*) varieties *viridis*, *vulgaris*, *ruber*, *purpureus*, and *simplex* at the College of Agriculture, Laguna, Philippines, from 1951 to 1953 disclosed that var. *purpureus* was the most susceptible to *Sclerotium rolfsii* [*R.A.M.*, 19, p. 220; cf. 30, p. 444].

Ghosh (T.) & George (K. V.). **Brown-rot of Mesta (Hibiscus cannabinus Linn.).**—*Indian Phytopath.*, 6 (*1953*), 2, pp. 106–109, 1 pl., 2 figs., 1954.

Cultivation of mesta (*Hibiscus cannabinus*) as a substitute for jute is on the increase in India. Since 1950 the Bengal plantings have suffered from a severe fungal disease which usually commences early in July, attains maximum severity in August, and continues until September. The apical leaves, stipules, petioles, leaf buds, and young stems are affected by a blackish-brown rot; the leaf buds and leaves become necrotic and drop off. Disintegration of the vascular tissues may

cause the stems to break open. At the Jute Agricultural Research Institute, Barrackpore, the pathogen was tentatively identified as a *Volutella* sp. The hyphae measure 2 to 2·6 μ in diameter, the sporophores 26 to 40 μ in length, and the oblong-ellipsoid, unicellular, thin-walled, hyaline spores, produced in pinkish sporodochia on the stem lesions, 5·98 to 15·6 by 3·4 to 5·2 (mostly 13·5 by 5) μ. On potato dextrose agar, but not on the host, six to 14 brown, thick-walled, three- to four-septate setae, 34·5 to 115 μ long are distributed irregularly in each sporodochium. Preliminary tests demonstrated that the fungus is an active parasite capable of infecting healthy, unwounded tissues. No variety, foreign or indigenous, was found to be immune; American Commercial was comparatively resistant.

Crandall (B. S.), Abrego (L.), & Patino (B.). **Mechanics of the control of Henequen black leaf spot in El Salvador.**—*Plant Dis. Reptr*, 38, 6, pp. 380–383, 1 fig., 1954. [Multilithed.]

Henequen (*Agave letonae*) black leaf spot (*Diplodia* [*Botryodiplodia*] *theobromae*), first reported in El Salvador in 1943, caused losses exceeding 30 per cent. of the total production in 1947. Selective cutting has since resulted in a progressive reduction in the incidence of the disease. The following measures are recommended: prompt removal of all diseased leaves and dead plants from the field, usually during clearing or cultivation operations; allowing cutters to include in their quotas diseased leaves, which should be graded out and destroyed at the decorticator and not in the field; and cutting more severely than usual, always including any diseased leaves encountered next to the whorl cut.

New or uncommon plant diseases and pests in England and Wales.—*Plant Path.*, 3, 1, pp. 29–30, 1954.

J. J. Baker records that perithecia of *Ophiostoma narcissi* [*R.A.M.*, 29, p. 562], not previously found in England, were present on rotting narcissus bulbs received from Lincolnshire in October, 1953. So far, the fungus has been found only in bulbs where primary rotting could be attributed to some other cause.

R. E. Taylor and F. Joan Moore state that in August, 1953, a severe outbreak of powdery mildew (*Erysiphe cichoracearum* or possibly *E. polyphaga*) [32, p. 215] occurred on pyrethrum (*Chrysanthemum coccineum*) at Luddington, Warwickshire.

N. C. Preston detected *Myrothecium roridum* [28, p. 462; 32, p. 607] on violets (*Viola odorata*) affected by stem rot at Burwarton, Shropshire, in May, 1953. This is the first record of the fungus on *V. odorata* in Britain.

Maag (R.). **La méthodologie de la protection des plantes en horticulture.** [Methods of plant protection in horticulture.] –*Rep. Int. hort. Congr.*, 13 (*1952*), pp. 545–551, 1953. [English summary.]

In Switzerland mixed greenhouse cultures of decorative plants are sprayed monthly with 0·1 per cent. copper carbonate (combined with an insecticide) as a preventive against fungus diseases. Rust of chrysanthemums [*Puccinia chrysanthemi*: cf. *R.A.M.*, 31, p. 384; C.M.I. map No. 117] and other hosts are controlled by 0·2 per cent. dithane Z-78 periodically.

Milbrath (D. G.). **Camellia flower blight control program.**—*Camellia Rev.*, 16, 1, pp. 13, 16, 1954.

In this discussion of the control of camellia flower blight (*Sclerotinia camelliae*) [*R.A.M.*, 33, p. 724] by the prevention of infection arising from apothecia [loc. cit.], it is recommended that after fresh mulching round the base of the shrubs a 3-in. layer of pine shavings should be added.

Wasscher (J.). **The Netherlands inspection service for ornamental plants.**—*Rep. Int. hort. Congr.*, 13 (*1952*), pp. 525–528, 1953. [French summary.]

The Netherlands Inspection Service for Ornamental Plants (N.A.K.S.) covers non-bulbous plants for propagation by seed or cuttings. In the Carnations Section special attention is paid to the occurrence of the wilt diseases, *Phialophora* [*Verticillium*] *cinerescens* [*R.A.M.*, 28, p. 400] and *Fusarium oxysporum* [30, p. 369; cf. next abstract], during voluntary greenhouse inspections which take place at least twice a year. These precautions have resulted in the increasing rarity of these diseases and in higher production of carnations. Three classes of certificate are given: AA, no vascular disease for two years; A, no vascular disease for one year; and B, healthy variety from an infected nursery.

Armstrong (Joanne K.) & Armstrong (G. M.). **Caryophyllaceae susceptible to the Carnation wilt Fusarium.**—*Phytopathology*, 44, 5, pp. 275–276, 1954.

An expanded account is given of a study of the host ranges of the wilt-inducing species of *Fusarium* directed towards the eventual revision of the section *Elegans*, particularly the host relationships of the carnation wilt fungus (*F. dianthi*) [*R.A.M.*, 33, p. 483], carried out at the South Carolina Agricultural Experiment Station. In tests with *F. dianthi* on various Caryophyllaceae *Dianthus barbatus*, *D. allwoodii* [var.] *alpinus*, *D. caesius* [*D. gratianopolitanus*], *D. deltoides*, *D. chinensis*, *Lychnis chalcedonica*, and three carnation varieties were highly susceptible, *Gypsophila paniculata* was extremely resistant, with only internal symptoms, and *Cerastium tomentosum* immune. No isolate of *F. oxysporum* f. *barbati* [21, p. 142], which attacked *D. barbatus* but not carnation, was available for comparison; evidently, however, it is either *F. dianthi* or a race of the latter with *D. barbatus* as the common host.

Plasman (A.). **Le flétrissement des Cinéraires causé par Phytophthora cinnamomi Rands.** [Wilt of Cinerarias caused by *Phytophthora cinnamomi* Rands.]—Reprinted from *Bull. Hort., Liége*, 9, 7, 2 pp., 1 fig., 1954.

Cinerarias grown under glass in Belgium annually sustain heavy damage from wilting and root-rot caused by *Phytophthora cinnamomi* [*R.A.M.*, 25, p. 166]. Shortly before flowering the lower, and about a week later, the upper leaves shrivel, though without discoloration. Whitish mycelium often appears at the base of the leaf stalks and the normally white roots turn brown. The only effective control method is soil sterilization of both seed compost and potting soil by heat treatment or by spraying the soil in thin layers twice with 2·5 per cent. formalin at 10 l. per sq. m.

Martin (C.). **Recherches sur les maladies à virus du Dahlia.** [Researches on virus diseases of Dahlia.]—*Ann. Inst. Rech. agron.*, Sér. C (*Ann. Épiphyt.*), 5, 1, pp. 63–78, 6 graphs, 1954.

In further work at the Central Station of Plant Pathology, Versailles, on dahlia mosaic virus [*R.A.M.*, 32, p. 679; 33, p. 424] and its extraction by repeated precipitation with saturated ammonium sulphate, experimental evidence demonstrated that the activity of cytochrome oxidase and tyrosinase in mosaic plants was considerably higher than in healthy ones. In the latter the absolute absorption of oxygen by sap in 20 minutes was nil or low, whereas in leaf sap from mosaic plants it reached 55 to 60 μl. and in tuber sap 20 μl. A similar oxygen absorption also occurred in tobacco plants with tobacco mosaic, cucumber mosaic, and potato X and Y viruses. It would appear that some substrate is probably present in much larger amounts in virus-affected than in healthy plants. The brown colour of the sap from affected plants and the oxygen absorption noted support this view and suggest that the substrate is a phenolic compound.

It was also ascertained that sap from mosaic dahlias turned a decolorized solution of 2,6-dichlorophenol indophenol bright blue, whereas that from healthy plants did not. This discovery was used to test 3,000 to 4,000 mature leaves taken during growth from apparently symptomless dahlias; the plants which gave a positive reaction were then kept in a greenhouse throughout the winter, and all developed characteristic symptoms; the others remained healthy. A similar result was obtained with sap from 8,000 tubers. This method rendered possible the detection of tobacco mosaic virus and potato virus Y in tobacco within 42 hours of infection.

In continued investigations (with J. Morel) [32, p. 191], the plants grown from tissue cultures taken from originally mosaic-infected Rêve Rose dahlias have been serologically tested twice and tested with indophenol on numerous occasions, but all have remained healthy for four years; thus the virus appears to have been eliminated from them. In further work on a larger scale other varieties 'cured' were Ville de Clermont-Ferrand, Jérôme Beyaert, Candeur du Valois, Porte du Ciel, and Mme E. Sawyer.

Gould (C. J.). **Botrytis diseases of Gladiolus.**—*Plant Dis. Reptr, Suppl.* 224, 33 pp., 6 figs., 1 graph, 1954. [Multilithed.]

In this article on *Botrytis* diseases of gladiolus in the United States, originally prepared for the Gladiolus Disease Symposium sponsored by the North American Commercial Gladiolus Growers at Cleveland in 1953, the author reviews the existing literature, citing some 83 titles, and includes some unpublished data. The effects of relative humidity, temperature, and other factors on the gladiolus corm during storage are discussed in relation to disease control. The species of *Botrytis* most frequently encountered are *B. gladiolorum* [*R.A.M.*, 33, p. 83], the principal pathogen, *B. cinerea* [27, pp. 476, 567], occasional on the aerial parts, *B. elliptica*, and *B. gladioli* [20, p. 364], both probably minor agents.

Beaumont (A.). **Diseases of Roses.**—*Gdnrs' Chron.*, Ser. 3, 136, 3538, pp. 175–176, 1954.

Rose diseases occurring [in Great Britain] are described with annotations showing the cause, means of identification, and control of each [cf. next abstract].

Schmidt (Trude). **Die wichtigsten Rosenkrankheiten und ihre Bekämpfung.** [The most important Rose diseases and their control.]—*Pflanzenarzt*, 7, 5, pp. 7–8, 1954.

Information is presented in semi-popular terms on the life-histories, symptomatology, relation to environmental factors, and control of the following rose diseases [cf. preceding abstract] in Austria: mildew (*Sphaerotheca pannosa* var. *rosae*), downy mildew (*Peronospora sparsa*), black spot (*Diplocarpon rosae*), rust (*Phragmidium subcorticium*) [*P. mucronatum*], brand canker (*Coniothyrium wernsdorffiae*), and grey mould or flower bud rot (*Botrytis cinerea*).

Azad (R. N.). **Saponaria leaf curl.**—*Indian Phytopath.*, 6 (*1953*), 2, pp. 141–143, 2 figs., 1954.

During 1952 *Saponaria vaccaria* beds at Delhi were practically devastated by a severe leaf-curl disease. The plants were stunted and the leaves curled and dwarfed, the veins on the under surface bearing profuse, irregular, granular outgrowths. Flowers were scanty or absent. When infected in the seedling stage the plants stopped growing at a height of 5 to 6 in. with a few large leaves and numerous small ones crowded on the stem. During later stages the leaves sometimes turned purple. The disease was successfully transmitted to healthy *S. vaccaria* in an insect-proof greenhouse by grafting but not by sap inoculation. This appears to be the first record of a virus on this host.

Kennedy (W. K.) & Schenk (R. U.). **The use of fungicides in the preservation of moist hay.**—*Agron. J.*, 46, 6, pp. 252–257, 2 graphs, 1954.

At Cornell University Agricultural Experiment Station, Ithaca, New York, two chemicals which had shown promise as preservatives of moist hay in the laboratory were tested in the field in 1951 and 1952. They were 2,4,6-trichlorophenol and *o*-dichlorobenzene (technical grades in both cases). The latter merely delayed mould development in storage for a short time, while the former involved heavy costs and technical difficulties and caused tainting of milk. Neither, therefore, can be recommended for field use.

Kilpatrick (R. A.), Hanson (E. W.), & Dickson (J. G.). **Root and crown rots of Red Clover in Wisconsin and the relative prevalence of associated fungi.**—*Phytopathology*, 44, 5, pp. 252–259, 1 fig., 1 graph, 1954.

An abstract giving a preliminary report of this work has already been noticed [*R.A.M.*, 30, p. 470]. During the period from 1949 to 1951 over 48,000 red clover plants between the ages of five weeks and 19 months were examined at the Department of Plant Pathology, University of Wisconsin, for root and crown rots [*R.A.M.*, 33, p. 676], which are a major problem in the State. The heaviest damage occurred in 1950 and the least in 1951. Among the factors involved in the annual fluctuations were the extent of winter injury, insect populations, and rainfall. Plants of all ages were susceptible, but infection was more virulent in second- than in first-year stands, and within each group the severity of the attacks increased from the beginning to the end of the season. Both tap roots and secondary ones and frequently the crowns were infected, the cortical tissues sustaining the most extensive damage in some cases and the vascular in others.

Fusarium oxysporum [loc. cit.] was the most prevalent of the fungi isolated followed by *F. solani* [33, p. 730], *F.* '*roseum*' [loc. cit.], *Phoma* spp., *Rhizoctonia* spp. [33, p. 729], and *Gliocladium roseum*. *F. solani* developed less frequently in plants grown on Plainfield sand than in samples from other types of soil; together with *F.* '*roseum*' it was most abundant in the roots of second-year plants. *Pythium* spp. were isolated only, and *R.* spp. mainly, from the cortical tissues, while others, e.g., *G. roseum*, were most commonly found in the vascular system.

Tomkins (R. G.). **Unsolved problems in the preservation of food : the influence of cultural conditions on the quality and preservation of fruits and vegetables.**—*J. Sci. Food Agric.*, 5, 4, pp. 161–167, 1954.

Among the problems of food preservation which are still awaiting solution in Great Britain are those connected with storage disorders of fruit, e.g., apple scald [*R.A.M.*, 32, p. 680] and low-temperature breakdown [31, p. 66], and with the effects of cultural conditions on their development. The bibliography comprises 19 titles.

Harris (R. V.). **The maintenance of healthy fruit clones.**—*Rep. Int. hort. Congr.*, 13 (*1952*), pp. 189–198, 1 fig., 1953. [French summary.]

A three-stage system is proposed for the maintenance of healthy fruit clones for vegetative propagation. In the first stage, tested virus-free mother plants are maintained in vector-proof cages, and are multiplied annually under protected conditions for planting in the primary field-propagating beds, forming the second stage. Stage three is concerned with the production, under certifiable conditions, of a limited harvest of planting-stock [*R.A.M.*, 31, p. 208].

Baumeister (Gabriele). **Sporenfang-Methoden.** [Spore-trapping methods.]—*Pflanzenschutz*, 6, 2, pp. 27–29, 3 figs., 1 graph, 1954.

Various laboratory and field methods of trapping spores of the apple scab

fungus [*Venturia inaequalis*: *R.A.M.*, 29, p. 102] are described, including those devised or improved by Wiesmann [14, p. 589], Friedrich [17, p. 254], Sproston (*Bull. Vt agric. Exp. Sta.* 550, 1949), and Ohne (*Comm. Gr.*, *1953*, p. 812, 1953), in relation to the prediction of epiphytotics of the disease at Jork, Schleswig-Holstein, Germany.

Belloni (V. G.). **Prove di lotta contro la ticchiolatura delle Pomacee.** [Experiments on the control of scab of the Pomaceae.]—*Notiz. Malatt. Piante*, *1954*, 26 (N.S.5), pp. 3–5, 1954.

In a test carried out by the Institute of Plant Pathology and Observatory for Plant Diseases, University of Milan, nine 13-year-old Golden Delicious apple trees were sprayed five times against *Venturia inaequalis* [*R.A.M.*, 32, p. 303] with products A (70 per cent. ferbam base), B (50 per cent. sulphur, 25 per cent. copper oxychloride), and C (50 per cent. sulphur, 33 per cent. copper oxychloride). Thirteen days after the final treatment the three groups had, respectively, 7·5, 5·6, and 13·1 per cent. infected leaves, as against 22·15 per cent. on the untreated. It appears from a late increase in scabbed leaves in A that ferbam may be less persistent in its effects than copper-sulphur.

On pear trees of two varieties given six applications of the same materials the lesions caused by *V. pirina* [32, p. 570] were observed to be increasing in numbers on the day of the final treatment, though it is concluded that products A and B gave good control of both diseases.

Cation (D.). **Timing is important for successful Apple scab sprays.**—*Quart. Bull. Mich. agric. Exp. Sta.*, 36, 4, pp. 349–356, 3 diags., 1954.

In 1953, a year in which growers considered it difficult to achieve satisfactory control of apple scab [*Venturia inaequalis*: *R.A.M.*, 33, p. 487] in Michigan, adequate reduction of leaf and fruit lesions was obtained in two orchards. In one near Paw-Paw all the trees (Delicious and Jonathan) received lime-sulphur for the first application and an organic mercurial for the second, the comparative eradicant and protectant treatments, starting at the pre-pink stage, being used alone or in succession according to the known fungicidal capacity of the materials in relation to the periods of infection, new growth, and rain incidence. The initial lime-sulphur treatment was both eradicative and protective, used at a period critical for control and when little injury is likely. Good results were given by coromerc (½ lb.) [in 100 gals.] alone or in combination (¼ lb.) with crag (¾ qt.) or captan (¾ lb.), tag (½ pint), and phygon (½ lb.) alone or in combination (¼ lb.) with magnetic 70 (4 lb.) or ferbam (¾ lb.). At Shelby the McIntosh orchard had not been sprayed the previous year and was heavily infected, as shown by 100 per cent. leaf and fruit infection on unsprayed trees. On those given a schedule of tag (½ pint), tag plus wettable sulphur (3 lb.), phygon (½ lb.), phygon, and captan, scab control was complete before the last spray was given. The results indicate that proper timing of the organic protective applications, particularly later when there is danger of scald and burning from wettable sulphurs, and good control during early stages of foliage development will be successful in eliminating scab.

Goodman (R. N.). **Apple fruits a source of overwintering fireblight inoculum.**—*Plant Dis. Reptr*, 38, 6, p. 414, 1954. [Multilithed.]

Virulent cultures of *Erwinia amylovora* were isolated at the University of Missouri, Columbia, from Jonathan apples [*R.A.M.*, 33, p. 157] picked in February, 1954, from trees which had been severely diseased during the previous spring and summer. It is concluded that the bacterium may overwinter in diseased fruits in Missouri and Arkansas, where 'hold-over cankers' are rarely observed.

COUTANCEAU (M.). **Impressions sur le comportement des variétés de Pommiers d'origines étrangères introduites en culture en France depuis 1930.** [Impressions of the behaviour of foreign Apple varieties introduced into France since 1930.]—*Rep. Int. hort. Congr.*, 13 (*1952*), pp. 674–686, 1 map, 1953. [English summary.]

Only a few varieties of apple trees of foreign origin introduced into France since 1930 to increase commercial yields have been of value. In southern regions Red Delicious, Starking, and Richard are useful, but north of the Loire they are susceptible to *Venturia inaequalis* [*R.A.M.*, 29, p. 157]. The variety Jonathan is fairly adaptable except in the south, where it is susceptible to *Sphaerotheca pannosa* [? *Podosphaera leucotricha*: cf. 33, p. 303].

BESTER (J. J. A.). **Gas storage of Bon Chrétien Pears.**—*Fmg in S. Afr.*, 29, 335, pp. 147–150, 2 graphs, 1954.

Experiments at the Western Province Fruit Research Station, Stellenbosch, South Africa, demonstrated that export-quality Bon Chrétien pears from the Ceres district suffered insignificant damage from superficial scald in gas storage at 31° F. for two to three months [*R.A.M.*, 22, p. 141]. After five months there was 88·8 and 81·5 per cent. scald in two gas treatments (10 and 5 per cent. carbon dioxide) but the damage was slight and the eating quality unimpaired. Comparable fruit stored in air suffered up to 100 per cent. severe damage in all tests. After a storage period of only two months internal breakdown, 14 days after removal, amounted to 45·9 per cent. in air storage but was negligible in the two gas stores. After five months' air storage the fruit suffered 100 per cent. breakdown 12 days after removal, whereas in gas-stored fruit incidence was 16·6 and 15·7 per cent., but was confined to the core and did not affect the flavour or texture.

KUNZE (L.). **Weitere Untersuchungen über Viruskrankheiten und andere Abbauerscheinungen der Süßkirsche.** [Further studies on virus diseases and other manifestations of degeneration in the sweet Cherry.]—*Pflanzenschutz*, 6, 8, pp. 105–108, 3 figs., 1954.

Chip-grafting experiments in the transmission of the sweet cherry Pfeffinger disease virus [*R.A.M.*, 33, p. 679, and next abstract] from Rhenish orchards [33, p. 162] to sour and Hedelfinger Riesen sweet cherry gave positive results at the Institute of Horticultural Virus Research, Berlin-Dahlem. A cherry ring spot virus which appears to cause no serious damage, observed near Boppard (Rhine), was also successfully transmitted by the same method. A disorder of cherries at Seeheim an der Bergstrasse, characterized by rosetting and chlorosis, is attributed to zinc deficiency [31, p. 494], the differences between which and the Pfeffinger virus disease are set out in tabular form.

The importance of stringent selection of stocks and scions for propagation, excluding not only obviously unhealthy but any even faintly suspicious material, is strongly emphasized.

MALLACH. **Pfeffinger-Krankheit in Bayern.** [Pfeffinger disease in Bavaria.]—*Pflanzenschutz*, 6, 8, p. 109, 1954.

At the end of July, 1954, a focus of the Pfeffinger cherry virus disease [see preceding abstract] was detected in two contiguous districts of Bavaria, Aschaffenburg and Alzenau, covering a total area of about 6 sq. km.

REID (R. D.). **Breeding Strawberries resistant to red core root rot.**—*Rep. Int. hort. Congr.*, 13 (*1952*), pp. 739–750, 1 graph, 1953. [French summary.]

The information in this paper about breeding strawberries resistant to red core

(*Phytophthora fragariae*) in Great Britain had already been noticed from another source [*R.A.M.*, 32, p. 323].

Kotlaba (Fr.) & Pilát (A.). **Hlízenka klikvová — Sclerotinia oxycocci Voron. v. Československu.** [Whortleberry scab—*Sclerotinia oxycocci* Voron. in Czechoslovakia.]—*Čes. Mykol.*, 6, 3–5, pp. 41–44, 2 figs., 1952.

A description is given of the *Sclerotinia* ascocarps, which occur in Czechoslovakia on fallen berries of *Vaccinium myrtillus* transformed into sclerotia. The ascocarps are similar to those of *S. baccarum* [cf. *R.A.M.*, 6, p. 646], but this is considered to be a synonym of *S. oxycocci*, which was observed on fallen berries of cranberry (*V. oxycoccus*) [cf. 12, p. 205] in 1951.

Pelletier (E. N.) & Hilborn (M. T.). **Blossom and twig blight of low-bush Blueberries (Botrytis cinerea).**—*Bull. Me agric. Exp. Sta.* 529, 27 pp., 2 graphs, 1954.

Considerable crop losses of low-bush blueberries (chiefly *Vaccinium angustifolium* and *V. canadense*, but also *V. corymbosum*) occur in Maine through the blossom and twig blight caused by *Botrytis cinerea* [*R.A.M.*, 33, p. 738]. Laboratory experiments showed the temperature range for the growth of the fungus to be between 5° and 32° C., with an optimum at 23°, the optimum for conidial germination being 8° to 29°.

Conidia can overwinter in a dry atmosphere, and the mycelium after overwintering under field conditions can sporulate within 24 hours if conditions are favourable. After nine days of incubation at high humidity the fungus will attack buds at all stages and blossoms after three or four days. The symptoms are similar to those of winter twig injury, salt spray injury, and frost damage and may be mistaken for these.

Susceptibility within a clone is constant but wide variations in susceptibility between clones makes estimation of prevalence in the field difficult. The mean percentage of infection on plants grown under peat mulch was 38·5, that of plants of the same clones under sawdust mulch 3·5. Infection was higher among plants receiving fertilizer (10–10–10) on 24th April than on those receiving it on 13th May, and was also higher with a complete fertilizer than with other ratios.

Of 41 fungicides tested [loc. cit.] in a laboratory assay against conidial germination, puratized agricultural, merculine 100, and velsicol 50–CS–46 were the most effective, followed by dynacide, vancide 51, phygon, bioquin, vancide F 995, and thiram.

In greenhouse tests crag 341, puratized, merculine, dynacide, actidione, tribasic copper sulphate, cop-o-zinc, crag 341, and phenyl mercury chloride proved toxic to blueberries.

In 1953 vancide ZW gave field control almost equal to fermate.

Purss (G. S.). **The fruit rots of the Custard Apple.**—*Qd J. agric. Sci.*, 10, 4, pp. 247–265, 14 figs., 1953.

Three diseases of custard apple in Queensland are described. Black canker (*Phomopsis anonacearum*) has occurred intermittently since 1926, causing economic losses in 1948–9 in the Sunnybank and Redland Bay areas near Brisbane, and later being reported from Charters Towers, North Queensland. The disease is characterized by purple lesions, varying from spots $\frac{1}{2}$ in. in diameter to blotches covering half the surface, near or at the apical end of fruits of all ages. The lesions become very hard and cracked with age; internally they are brown and less than $\frac{1}{4}$ in. deep. The surrounding tissue remains sound, but the fruit is unfit for marketing. *P. anonacearum* was also associated with a marginal leaf scorch. Though patho-

genicity tests were inconclusive, pycnidia were consistently found on both fruit and leaf lesions.

Purple blotch (*Phytophthora palmivora*), first recorded at Sunnybank in February, 1950, is potentially dangerous during periods of high rainfall. The first indication of the disease is generally an excessive fall of small, immature fruit. Fruits of all sizes on the lower branches develop large, purple lesions with indistinct margins, the affected parts remaining soft; internally a brown discoloration spreads through the entire fruit, even before it falls, and into the stalk. Fallen fruits become mummified.

Botryodiplodia theobromae [cf. *R.A.M.*, 6, p. 341], though frequently encountered, particularly round Brisbane, is not very serious. External symptoms resemble those of black canker but the fruits become mummified and remain on the tree. The lesions extend over at least half the fruit, becoming hard and cracked and bearing numerous pycnidia. A brown, corky condition similar to that associated with purple blotch often affects the entire internal tissue. Fructifications have frequently been associated with stem dieback, but it is not known whether the fungus acts as a parasite or a secondary invader. The importance of orchard hygiene in the control of all three diseases is emphasized.

Stover (R. H.). **Flood-fallowing for eradication of Fusarium oxysporum f. cubense. II. Some factors involved in fungus survival.**—*Soil Sci.*, 77, 5, pp. 401–414, 2 graphs, 1954.

In further work at the Division of Tropical Research, United Fruit Company, La Lima, Honduras [*R.A.M.*, 33, p. 307], the duration of survival of the banana wilt fungus (*Fusarium oxysporum* f. *cubense*) in soils submerged under 1½ to 3 ft. of water in flood-fallowed lakes ranged from 25 to 80 days [33, p. 380]. In soil submerged under 1 in. of water in the laboratory the period varied between 45 and 165 days. Under these conditions there was no consistent difference between sand, clay loam, and organic soils.

At a temperature of 13° C. the numbers surviving in submerged soils were 10 to 20 times larger than at 24° to 34°, and they persisted at least 90 days longer. In water or mineral oil in the laboratory, larger populations survived for at least 90 days longer than in a mixture of water and soil. In flood-fallowed lakes the numbers were larger and the survival period longer on the lake floor and in the water than in submerged soil.

Under anaerobic conditions *F. o.* f. *cubense* did not persist for 14 weeks in any of the field soils tested, the maximum period in saturated soil being six weeks and at least seven in soils 50 per cent. saturated. The pathogen lived at least four to six weeks longer in potato dextrose agar cultures than in soil. The aeration of submerged soils by flowing water increases the surviving population and its period of existence by a minimum of 70 days as compared with submersion under stagnant or non-aerated water.

It is suggested that gaseous relationships of a chemical nature and the physiological state of the fungus are more important factors in the determination of survival than the direct action of micro-organisms, which may, however, be of indirect significance in their utilization or production of oxygen and other compounds.

Oxenham (B. L.). **Notes on two Pineapple diseases in Queensland.**—*Qd J. agric. Sci.*, 10, 4, pp. 237–245, 4 figs., 1953.

Most of this information on pineapple white leaf spot (*Thielaviopsis* [*Ceratocystis*] *paradoxa*) [*R.A.M.*, 29, p. 202] and fruitlet core rot [14, p. 216; cf. 32, p. 575] in Queensland has already been noticed in this *Review*. The latter disease, most prevalent in winter fruit and worse in ratoon than in plant crops, caused severe

losses of Ripley Queen in the Brackenridge district near Brisbane during 1951–2. Affected plants were infested by mealybugs (*Pseudococcus brevipes*). In needle inoculation experiments with organisms isolated from diseased fruitlets a *Fusarium* sp. produced restricted brown lesions, while two types of *Penicillium* caused more extensive infection, spreading towards the core.

Ramírez Silva (F. J.). **The effect of certain micronutrient elements on the growth and yield of Pineapple plants.**—*Rep. Int. hort. Congr.*, 13 (*1952*), pp. 1230–1232, 1953. [French summary.]

In an investigation of the degeneration and chlorosis of pineapple plants in Puerto Rico [*R.A.M.*, 32, p. 490], micronutrients were added to culture solutions containing slips of the Smooth Cayenne variety. Iron increased the yield and sugar content of the plants, and also promoted early flowering and maturing of the fruit. Manganese and boron were beneficial, and aluminium increased the yield. Copper and manganese at 2 p.p.m. caused severe chlorosis in the absence of iron. Aluminium, zinc, and iron all reduced the disorder.

Greig (A. M. W.). **The ecological factors affecting the commercial production of certain subtropical fruits in New Zealand.**—*Rep. Int. hort. Congr.*, 13 (*1952*), pp. 1191–1199, 1953. [French summary.]

The most important diseases attacking commercial crops of tree tomato (*Cyphomandra betacea*) in New Zealand are powdery mildew (*Oidium* sp.), which is controlled by sprays of lime sulphur (1:160 gals.) plus colloidal sulphur (2 lb.: 100), and tree tomato mosaic [*R.A.M.*, 27, p. 116]. The Chinese gooseberry (*Actinidia chinensis*) is affected by crown gall (*Bacterium tumefaciens*).

Papo (S.) & Peleg (J.). **Trials in control of the Olive leaf spot, caused by the fungus Cycloconium oleaginum.**—*Bull. Minist. Agric. Israel* 34, 19 pp., 3 figs., 6 graphs, 1952. [Hebrew, with English summary. Received 1954.]

Trials carried out at the Department of Plant Pathology, Division of Plant Protection, [Rehovot], Israel, with yellow cuprocide (0·25 per cent.) plus perenox (0·5 per cent.) and dithane Z-78 (10 per cent. dust or 0·3 per cent. spray) against *Cycloconium oleaginum* on olives [*R.A.M.*, 29, p. 626] demonstrated that copper-containing sprays gave the best control and increased yields. In wet years one spray in the second half of October followed by one in January gave the most efficient results, while in dry years only the first application was necessary.

Drees (H.). **Über Umfang und Bedeutung chemischer Pflanzenschutzmaßnahmen.** [On the scope and importance of chemical plant protection methods.]—*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), *Stuttgart*, 6, 7, pp. 97–101, 2 graphs, 1954.

During the financial year 1952–3 the total outlay on fungicides in Western Germany was DM. 24,800,000 [cf. *R.A.M.*, 31, p. 564]. The weight of mercurials used for cereal seed treatment, covering nearly 3,000,000 ha. or 65 per cent. of the whole area under cereals, was estimated at 920 tons and the expenditure on materials (exclusive of labour) at DM. 4,200,000 (1·40 per ha.).

The protection of vines [against *Plasmopara viticola*] necessitated an average of three treatments with 1·5 per cent. copper oxychloride (containing 15 to 18 per cent. copper), for which the total amount required was approximately 4,500 tons at a cost of DM. 6,800,000. Only 5 to 10 per cent. (on an average) of the apple trees in the Federal Republic were given one pre- and one post-blossom treatment against scab [*Venturia inaequalis*] with copper oxychloride (containing 45 to 50 per cent. copper); 150 tons were used at a cost of DM. 400,000. Several applications

of sprays containing 45 to 50 per cent. copper for potato blight [*Phytophthora infestans*] control necessitated more than 2,000 tons (DM. 8,000,000).

Sulphur is largely used in the vineyard against *Oidium* [*Uncinula necator*]; the amount needed for two applications of a spray at 0·2 per cent. was 500 tons and for two dust treatments 2,600 tons at a total cost of DM. 5,400,000.

Misra (A. P.). **Preliminary trials of some proprietary fungicides and weedicides in the field.**—*Plant Prot. Bull., New Delhi*, 4, 3, pp. 63–65, 1952.

This information on the fungicides recommended by the Central Directorate of Plant Protection, Quarantine and Storage, for use against plant diseases in Delhi State, their composition, application, and hosts on which they have given successful results has been noticed from another source [*R.A.M.*, 33, p. 711].

Bollen (W. B.), Morrison (H. E.), & Crowell (H. H.). **Effect of field treatments of insecticides on numbers of bacteria, Streptomyces, and molds in the soil.**—*J. econ. Ent.*, 47, 2, pp. 302–306, 1954.

At Oregon Agricultural Experiment Station field applications of BHC and DDT depressed the counts of *Mucor*, *Penicillium* (the predominant organism), and *Aspergillus* spp. in sandy, silty clay, and clay loam soils, while toxaphene significantly increased them in peat. In one trial aldrin inhibited mould development and dieldrin stimulated it. D-D alone definitely reduced the mould population, lowering the percentage of *Penicillium* to about half the normal. The addition of ammonia, however, reversed this tendency except in the case of *Penicillium*. The numbers of *Streptomyces* spp. were not significantly influenced by the treatments.

Rich (S.), Horsfall (J. G.), & Keil (H. L.). **The relation of laboratory to field performance of fungicides.**—*Rep. Int. hort. Congr.*, 13 (*1952*), pp. 282–287, 1953. [French summary.]

The laboratory testing of fungicides, developed during the past 20 years, gives accurate data which can be used to predict field performance and has greatly facilitated the production of a large number of versatile commercial preparations for the treatment of plant diseases. Some of the factors determined are (*a*) the dose which will inhibit half the spore population, or ED 50, (*b*) the slope of the dosage/response curve, (*c*) the ability to build up residues, (*d*) the slope of the wash-off curve, (*e*) the rate of chemical degradation, and (*f*) the fungitoxicity of breakdown products.

Richardson (J. H.), Del Guidice (V. J.), & Wiesman (C. K.). **Hazards of spores in floor coverings—sawdust.**—*Appl. Microbiol.*, 2, 4, pp. 177–182, 5 figs., 1954.

In tests in processing rooms of the meat-packing department of Armour and Company, Chicago, milmer I, a powder form of copper-8-quinolinolate, was fungistatic at a strength of 0·14 per cent. to [unspecified] moulds [cf. *R.A.M.*, 30, p. 59] from the sawdust floor covering and fungicidal at higher concentrations. Soluble copper-8-quinolinolate, under the trade mark cunilate, was fungicidal in all forms tested and in a variety of solvents at concentrations of and exceeding 0·07 per cent. The emulsified form, cunilate 2149, was fungicidal in a pilot plant-scale test. The objectionable odour associated with cunilate in isopropanol, mineral oil, xylene, or mineral spirits is absent from the compound in emulsified form. Dimethyldodecylamine was fungistatic at a concentration of 2·8 per cent.

Rich (S.) & Horsfall (J. G.). **Relation of polyphenol oxidases to fungitoxicity.**—*Proc. nat. Acad. Sci. Wash.*, 40, 3, pp. 139–145, 1954.

In further work at Connecticut Agricultural Experiment Station [cf. *R.A.M.*,

33, p. 614] the inhibitory action of 42 phenols and quinones [29, p. 162] on the polyphenol oxidases produced by spores of *Stemphylium sarciniforme* [32, p. 389] and *Sclerotinia fructicola* was investigated. Most of the compounds which gave colour reactions with the extract from *Stemphylium sarciniforme*, containing an enzyme of the laccase-type, were non-toxic to the spores, but unchanged compounds were almost all toxic and inhibitors of the polyphenol oxidase. All the enzyme inhibitors were toxic to *S. sarciniforme* spores. Less correlation was observed between the interaction of fungal extracts with test compounds and the toxicity of the compounds to the spores of *Sclerotinia fructicola*, which produced tyrosinase-type oxidase. Of the seven compounds giving a colour reaction only two were toxic and of the 35 non-reacting substances 32 were toxic.

The authors postulate that the polyphenol oxidases of *S. fructicola* and *Stemphylium sarciniforme* are able to destroy the toxicity of some phenols and quinones. The greater susceptibility of the former organism to these compounds is possibly due to a more limited substrate range of its enzymes.

Ciferri (R.). **L'impiego dell' etilenbisditiocarbamato di zinco per trattamenti a secco.** [The use of zinc ethylenebisdithiocarbamate for dry treatments.]—*Notiz. Malatt. Piante, 1953*, 27 (N.S.6), pp. 7–14, 1954.

During 1953, 'Croatina' vines at Stradella, Italy, were dusted six times against *Plasmopara viticola* with dithane Z-78 [*R.A.M.*, 33, p. 436], alone and mixed with sulphur in the proportions 10:90 and 30:60; with sulphur alone; and with caffaro powder (16 kg. of metallic copper per ql.), alone and mixed with sulphur at 30:70, 50:50, and 10:90.

The sum of three disease estimates taken at the end of June, middle of July, and during the first ten days of August, according to a scale in which 0 represented no damage and 5 the whole cluster dried up or every berry affected, gave the following average disease coefficients for the different treatments, respectively: 1·32, 3·83, 5·4, 14·31, 4·96, 6·35, 6·35, and 12·87. A degree of protection comparable with that given by copper-sulphur would be secured at less expense by dusting with dithane-sulphur (50:50); this also controls *Oidium* [*Uncinula necator*]. Ordinary copper-sulphur contains too little copper and gives inadequate control of *P. viticola*. If caffaro powder is used with sulphur, 30 to 50 per cent. of the mixture (by weight) should consist of caffaro.

Treatment of potato tubers to prevent germination and dry rot (*Fusarium* spp.) with dithane Z-78 plus 0·5 per cent. naphthaleneacetic acid, the acid alone, dithane alone, and talc alone gave, respectively, 6, 5, 31, and 26 per cent. germination and 4, 13, 2, and 17 per cent. dry rot.

Gladiolus corms, wounded and sprayed with a cultural suspension of *F. oxysporum* var. [f.] *gladioli* [32, p. 562] and *Penicillium gladioli* [30, p. 107; cf. 33, p. 605], then dusted with dithane or copper oxychloride or talc and kept in a dark, rather damp cellar from 22nd October, 1953, until 3rd March, 1954, developed 13·3, 33·3, and 70 per cent. combined infection, respectively [cf. 33, p. 483].

Pelargonium hortorum shoots, which are highly susceptible to rotting by *Pythium* spp. sometimes in association with *F.* spp. at the Botanic Gardens, Pavia, were dusted with dithane, dithane plus talc (50:50), zinc oxide, and talc, planted in pots of soil from the Gardens, and kept at 25° C. and 90 per cent. relative humidity. After five weeks, average infections (estimated according to an arbitrary scale) for the four treatments, respectively, were 0·25, 1·17, 1·75, and 3·83 per cent.

Samples of Maratello rice seed with 26 per cent. infection by *F. moniliforme* [*Gibberella fujikuroi*: 31, p. 457] and 11 per cent. by *Piricularia oryzae* [31, p. 456] were sprayed in addition with culture inoculum and dusted with 0·3 per cent. of dithane dust at 3 gm. per 100 gm. seed or with the same quantity of talc. The dithane-treated seed developed on an agar medium 7 and 19 per cent. infection by

G. fujikuroi and *P. oryzae*, respectively, the corresponding figures for talc being 91 and 63 per cent.

Salto (L.) & Ripa (L.). **Ricerche preliminari sull'azione fungicida dell'acetato dell' 1-idrossietil-2-eptadecenil(8)-4,5-diidroimidazolo.** [Preliminary researches on the fungicidal action of 1-hydroxyethyl-2-heptadecenyl(8)-4,5-dihydroimidazoline acetate.]—*Ann. Sper. agr.*, N.S., 7, 3, pp. 863–882, 4 graphs, 1953. [English summary.]

In tests carried out at the Cryptogamic Laboratory, Pavia, Italy, glyoxalidine acetate (ammina 220), at 0·105, 0·03, 0·06, 0·12, and 0·25 per cent., (1) in aqueous solution; (2) in the solvent butylcellosolve (1:1); and (3) as in (2) plus the insecticide toxaphene, were compared with caffaro powder (0·06, 0·125, 0·25, 0·5, and 1 per cent.) for fungicidal effectiveness against spores of four fungi in watch-glasses by the mist technique.

With *Alternaria tenuis* the four materials at 0·25 per cent. gave, respectively, 99, 99, 94·5, and 61 per cent. non-germinated spores; with *Clasterosporium carpophilum* the corresponding figures were 74, 71, 74, and 48 per cent.; with *Piricularia oryzae* 73·9, 23·9, 65·2, and 29 per cent.; and with *Fusarium solani* 96·5, 94, 100, and 81 per cent.

Van der Kerk (G. J. M.) & Klöpping (H. L.). **Investigations on organic fungicides. VII. Further considerations regarding the relations between chemical structure and antifungal action of dithiocarbamate and bisdithiocarbamate derivatives.**—*Rec. Trav. chim. Pays-Bas*, 71, 11, pp. 1179–1197, 2 graphs, 1952.

In further experiments in this series [*R.A.M.*, 31, p. 392], concerned with the primary mode of action of fungicides derived from dithiocarbamic acid [33, p. 308], it was shown that both the lower dialkyldithiocarbamates and the alkylene bisdithiocarbamates have antifungal spectra with distinctly differing characteristics. These two groups also exhibit different effects on stages of fungal growth, the activity of the former being higher against spore germination than against mycelial growth.

In germination these compounds, as well as the corresponding thiuram sulphides, interfere either with the synthesis or the metabolism of L-histidine [loc. cit.].

Mycelial growth and respiration are also inhibited by the lower dialkyldithiocarbamic acid derivatives; thus in the various stages of fungal development there are enzyme systems differing in sensitivity towards these compounds.

Botrytis cinerea and *Penicillium italicum* are more sensitive to sulphur fungicides than *Aspergillus niger* and *Rhizopus nigricans* [*R. stolonifer*]. A table shows the fungistatic activity of 38 compounds to these four test species, and the type of antifungal spectrum of each.

Vicklund (R. E.), Manowitz (M.), & Bagdon (V. J.). **Mechanism of action of copper 8-quinolinolate.**—*Mycologia*, 46, 2, pp. 133–142, 1 fig., 1954.

Observations made during various biological tests conducted at the Engineer Research and Development Laboratories, Fort Belvoir, Virginia, suggest that copper 8-quinolinolate [cf. *R.A.M.*, 28, p. 233, *et passim*] must first dissociate into 8-hydroxyquinoline and copper, and each performs different but uniquely related functions. The 8-hydroxyquinoline inhibits the fungus by precipitating the metals concerned in metabolism. The copper ions function synergistically with the 8-hydroxyquinoline. Evidence in support of this theory was provided by agar toxicity tests with *Aspergillus niger* which demonstrated that the fungistatic activity of both 8-hydroxyquinoline and copper 8-quinolinolate could be reversed by the addition of metallic ions to the culture medium. Copper and 8-hydroxyquinoline together produced activity greatly in excess of the sum of their

individual activities. It is regarded as highly significant that the reversal of activity required a great excess of metallic ions over the stoichiometric amount. Zentmeyer (*Science*, 100, pp. 294–295, 1944), using about three times the stoichiometric amount of zinc, obtained only a 78 per cent. reversal. This indicates that the reversal is meeting with opposition, probably caused by dissociation of the metal quinolinolate.

It is suggested that the dissociation of copper 8-quinolinolate may be brought about by the fungus hydrolyzing the compound or by ionization in water. The compound is highly insoluble, but was completely inhibitory in the agar toxicity tests at concentrations approximating to the saturation level. The theory implies that the fungus may possess some means of inactivating 8-hydroxyquinoline, which is much less effective than its copper salt. A mould enzyme might possibly oxidize it, forming a compound that would not precipitate the essential metallic ions and would accordingly be inactive. Some experimental evidence was obtained in support of this conjecture in tests (by S. Gottlieb and J. H. Geller) which showed that a lignin oxidase obtained from fungi oxidized 8-hydroxyquinoline. The view that copper organic compounds owe their activity to copper and that the remainder of the molecule merely determines how firmly the copper will be bound to the textile or other material to which it is applied is no longer tenable as a general rule.

The theory opens up several approaches to the development of new fungicides. Firstly, as copper 8-quinolinolate does not function as a molecular entity it is unnecessary to use the compound as such to achieve its fungistatic effects; any copper salt can be mixed with 8-hydroxyquinoline or certain of its derivatives to produce equivalent fungistatic activity [27, p. 251], and by this means many mixtures with different physical and chemical properties can be prepared. A second approach is to use chelating agents other than 8-hydroxyquinoline. Many of these are active, further supporting the view that chelation is a factor in their mechanism of action. Tested with textiles, the ammonium salt of *N*-nitroso-*N*-phenyl-hydroxylamine approximated in activity to copper 8-quinolinolate, though with paint it was less effective.

ZEUMER (H.). **Methoden zur Prüfung von Pflanzenschutz- und Vorratsschutzmitteln LIX. Die Bestimmung der Schwebefähigkeit von Spritzsuspensionen.** [Methods for the assay of plant- and stores-protectives LIX. The determination of suspensibility of spray suspensions.]—*NachrBl. dtsch. PflSchDienst (Braunschw.), Stuttgart*, 6, 4, pp. 57–58, 1 graph, 1954.

In a further contribution to this series [*R.A.M.*, 33, p. 491] Hengl and Reckendorfer's method (*Fortschr. d. Landw.*, 2, pp. 686–693, 1927), used at the Brunswick branch of the German Biological Institute for the determination of suspensibility of spray suspensions, is described and the requisite standards defined [*R.A.M.*, 29, p. 519]. The latter conform to the standards for suspensibility as gauged by the cylinder method (*NachrBl. dtsch. PflSchDienst, Berl.*, 18, pp. 97–99, 1938).

LANDRETH (J.). **Power charging of knapsack sprayers.**—*Tea Quart.*, 25, 1, pp. 15–16, 1 pl., 1954.

A description is given of the design and operation of a power-operated charge pump unit, consisting of an iron chassis mounted with a 200-gal. tank, pumping unit, 16 knapsacks, and a 3-gal. fungicide mixer. The belt-driven pump, powered by a 3 h.p. engine, has an output of 6 gals. per minute at a pressure of up to 200 lb. per sq. in. and charges six 'Favori-Colibri' knapsacks simultaneously. The whole unit can be attached to a tractor. The over-all dimensions are: length 38 in., width 24 in., and height 25 in. This apparatus has been tested out on St. Coombs Tea Estate during the past six months and found highly satisfactory. Petrol con-

sumption is approximately ½ gal. per six-hour working day, serving 12 sprayers, and permits a daily coverage of approximately three acres by each labourer. An improved model 'Vitiver' is now available.

Brian (P. W.). **The control of plant diseases with antibiotics.**—*Chem. Prod.*, 17, 4, pp. 139–141, 1954.

This is a survey of current investigations on the therapy of plant diseases by means of antibiotics [*R.A.M.*, 33, p. 681]. Nearly all the 31 papers listed in the bibliography have already been noticed in this *Review*.

Stallings (J. H.). **Soil produced antibiotics—plant disease and insect control.**—*Bact. Rev.*, 18, 2, pp. 131–146, 1954.

A bibliography of 107 titles was consulted in the preparation of this summary of the available information on antibiotics produced in the soil, which is presented (following a general introduction to the subject) under the headings of antibiotic-producing soil micro-organisms, antibiotic production in soil, antibiotics and plant disease control [see preceding abstract], carbohydrate level and disease control, antibiotics and virus control, antibiotics and insect control, synergism, rhizosphere and microbial activity, and disease resistance.

Barton (Lela V.) & Macnab (Jean). **Effect of antibiotics on plant growth.**—*Contr. Boyce Thompson Inst.*, 17, 7, pp. 419–434, 2 figs., 1954.

At the Boyce Thompson Institute for Plant Research, New York, the growth of Marquis seedling wheat roots in culture was enhanced by bacitracin, polymyxin, potassium penicillin G, streptomycin trihydrochloride [cf. *R.A.M.*, 33, p. 681], terramycin hydrochloride, and thiolutin [cf. 32, pp. 267, 270] at certain concentrations in distilled water. Potassium penicillin G permitted more than a tenfold increase in root length at concentrations ranging from 32 to 0·1 p.p.m. in distilled water with the sole exception of 0·32 p.p.m., and was far less toxic than the other antibiotics. One-week-old terramycin solutions were more beneficial than fresh ones. Growth was not increased by adding any of these antibiotics to tap water or to nutrient solutions. However, catenulin and magnamycin increased elongation in tap water, while sodium rimocidin, streptomycin sulphate, and crude terramycin increased it equally in distilled or tap water. Terramycin hydrochloride at 32 and 10 p.p.m. produced a similar degree of growth in distilled, demineralized distilled, and tap water.

Some evidence of the chelating effect of terramycin hydrochloride was demonstrated by the addition of iron and by comparison with the chelating agent, ethylenediaminetetracetic acid. The addition of calcium ions to the solution reduced the injury to wheat roots produced by 10 and 32 p.p.m. of the antibiotic.

In limited tests there was no increase in germination or survival and growth of seedlings following the presoaking of seeds in antibiotics or their addition to the soil.

Cooke (W. B.). **The use of antibiotics in media for the isolation of fungi from polluted water.**—*Antibiot. & Chemother.*, 4, 6, pp. 657–662, 1954.

At the Robert A. Taft Sanitary Engineering Center, United States Public Health Service, Cincinnati, Ohio, rose bengal [*R.A.M.*, 33, p. 501] was found to be more effective than phloxine for elimination of bacteria from the [unspecified] mould populations of sewage samples [33, p. 246]. It was found that aureomycin (chlortetracycline) and streptomycin or dihydrostreptomycin sulphate could be held in aqueous suspension for at least three months under refrigeration without appreciable decline in efficiency as compared with only a fortnight for terramycin (oxytetracycline). Chloramphenicol proved to be less effective than streptomycin in the inhibition of bacterial growth. On the basis of these observations the medium

recommended for moulds from polluted water and sewage is non-acidified Waksman soil agar (*J. Bact.*, 7, pp. 339–341, 1922) for mould plate counts, substituting phytone (an enzymatic hydrolysate of plant proteins, especially from soy-beans, supplied by the Baltimore Biological Laboratories) or soytone (Difco Laboratories) for peptone and adding rose bengal at a concentration of 0·035 gm. per l. and aureomycin at the rate of 35 μgm. per ml. Terramycin may also be used if freshly made up or kept not longer than a few days in aqueous solution.

Anleitung für die Untersuchung von Pflanzen, Pflanzenteilen und Pflanzenerzeugnissen bei der pflanzensanitären Abfertigung durch die Amtliche Deutsche Pflanzenbeschau. Zweite, erweiterte und neubearbeitete Auflage. [Guide to the examination of plants, plant parts, and plant products for plant health export by the Official German Plant Inspection Service. Second, enlarged and revised edition.]—100 pp., 5 col. pl., 80 figs., Biologische Bundesanstalt für Land- und Forstwirtschaft, 1954.

This useful booklet, intended for the use of Plant Inspection Service officials employed at customs-houses, comprises information on the taking of samples, methods of examination, and the principal diagnostic characters of plant diseases and pests to be excluded from entry into Germany [*R.A.M.*, 33, p. 583].

Klemm (M.). **Pflanzenschutzmeldedienst und Prognoseforschung im Pflanzenschutz.** [Plant protection warning service and research on prognosis in plant protection.]—*Dtsch. Landw.*, 5, 7, pp. 377–379, 1954.

Using his studies on clover rot [*Sclerotinia trifoliorum*: *R.A.M.*, 18, p. 318] as an example, the author describes the methods of prognosis used in the East German plant protection warning service and comments on some of the difficulties, such as lack of experienced reporters and repeated boundary changes, encountered in the collection of statistical material [cf. 25, p. 226].

Böttcher (H.). **Der Arbeitsaufwand für die Pflanzenschutzmaßnahmen (Untersuchungen in 14 landwirtschaftlichen Betrieben des mitteldeutschen Raumes in den Jahren 1949–1952).** [The employment of labour for plant protection measures (investigations in 14 agricultural concerns of the central German area in the years 1949 to 1952).]—*Agrartechnik*, 4, 4, pp. 109–110, 1 graph, 1954.

Particulars are given of the hours of labour involved in plant protection operations on 14 farms in central Germany [*R.A.M.*, 33, p. 409].

Rademacher (B.). **Krankheiten und Schädlinge im Acker- und Feldgemüsebau. Zweite erweiterte Auflage.** [Diseases and pests in agriculture and market-gardening. Second, enlarged edition.]—261 pp., 3 col. pl., 123 figs., 1 diag., Stuttgart (z. Zt Ludwigsburg), E. Ulmer, 1954. DM. 11.80 (boards), 13 (cloth).

Recent developments in plant protection have necessitated considerable amplification in the second edition of this manual [*R.A.M.*, 28, p. 473], especially in respect of control methods, and a number of additional diseases and pests are also included.

Carter (W.). **The insect and the plant disease.**—*J. econ. Ent.*, 47, 2, pp. 210–215, 1954.

In general, the problems associated with insect-borne plant diseases may be assigned to three categories, i.e., those caused by micro-organisms carried to the host by insects, the toxin-induced disease, and insect-transmitted viroses. Well-known examples are cited to illustrate each group and discussed in relation to

geographical distribution, various lines of research, and international plant interchange aspects, emphasizing the difficulties in the enforcement of quarantine regulations incidental to modern means of transport of plant material and advocating the development of resistant varieties as the most practical control measure.

Young (R. A.). **Dissemination of plant pathogens on nursery and ornamental plants.**—*Plant Dis. Reptr*, 38, 6, pp. 417–420, 1954. [Multilithed.]

The author discusses the serious and far-reaching results of the dissemination of plant diseases in nursery stock, including ornamental plants and fruit trees, with particular reference to observations made in Oregon.

Bremer (A. H.). **Norwegian vegetable and fruit varieties.**—*Rep. Int. hort. Congr.*, 13 (*1952*), pp. 643–648, 1 pl., 1 map, 1953. [French summary.]

A new greenhouse tomato variety, Kvithamar, resistant to leaf mould (*Cladosporium fulvum*) [cf. *R.A.M.*, 32, p. 470], has been bred in Norway recently. Two apple varieties, Høynes and Haugeple, are fairly resistant to scab [*Venturia inaequalis*: 32, p. 62] and are grown in the wet coastal areas. The turnips Sola and Forus are resistant to club root (*Plasmodiophora brassicae*) [cf. 31, p. 527; 33, p. 697].

Imshenetsky (A. A.). Изменчивость и селекция микроорганизмов. [Variation and selection in micro-organisms.]—Природа [*Nature = Priroda, Moscow*], 43, 5, pp. 35–44, 1 col. pl., 4 figs., 1 diag., 5 graphs, 1954.

The author discusses in general terms, with reference to Soviet research work [without literature citations], variation and selection in micro-organisms, particularly yeasts and moulds.

Takemaru (T.). **Genetics of Collybia velutipes. I. Mating type and barrage phenomenon (2).**—*Bot. Mag., Tokyo*, 67, 789–790, pp. 82–86, 1 fig., 1954.

In mating experiments carried out at Tokyo University with all combinations of 21 monosporous mycelia of *Collybia velutipes* [*R.A.M.*, 33, p. 619] the fungus was shown to be heterothallic and tetrapolar. In some combinations antagonism between the mycelia was observed, but its occurrence was very erratic.

Corti (G.). **A new method of staining spores of Streptomycetaceae.**—*J. Bact.*, 68, 3, pp. 389–400, 1 fig., 1954.

In research studies at Milan, Italy, spores of 100 strains of Streptomycetaceae on various agar media were stained by treating slide mounts for two minutes with a mixture of vesuvin (Bismarck brown) and toluidine blue [*R.A.M.*, 33, p. 623], two parts of both at 1:1,000, and ammonium sulphate (saturated solution) one part. After washing, the mycelium without further treatment or after mounting in balsam appears bright yellow and the spores blue. Clearly visible in the hyphae are red-brown granules. The blue coloration sometimes developed in the hyphae of the aerial mycelium of cultures that had not yet sporulated.

Berk (S.) & Teitell (L.). **Radioactive materials in prevention of mold growth in optical instruments.**—*Industr. Engng Chem.* (*Industr.*,) 46, 4, pp. 778–784, 6 figs., 1 diag., 1 graph, 1954.

This is a fully detailed, tabulated survey of experiments at the Pitmann-Dunn Laboratories, Frankford Arsenal, Philadelphia, in the control of [unspecified] mould growth on a M3 binocular by means of ionizing radiations from radium and polonium [*R.A.M.*, 32, p. 444]. Although effective, the difficulty of this mode of

treatment and the potential health hazards incurred in its application would seem to preclude its general use. It might be used, however, for the protection of simple instruments (not containing prisms) or in special cases where other control measures are inapplicable.

KELLER (H. G.). **Untersuchungen über das Wachstum von Cenococcum graniforme (Sow.) Ferd. et Winge auf verschiedenen Kohlenstoffquellen. Ein Beitrag zur Kenntnis der Physiologie der mykorrhiza-bildenden Pilze.** [Studies on the growth of *Cenococcum graniforme* (Sow.) Ferd. & Winge with various carbon sources. A contribution to the knowledge of the physiology of mycorrhiza-forming fungi.—Thesis, Federal Technical Institute, Zürich, 123 pp., 30 graphs, 1952. [Mimeoprinted.]

The Swedish strain of *Cenococcum graniforme* [*C. geophilum*: *R.A.M.*, 31, p. 292] used in this contribution to the knowledge of the physiology of mycorrhizal fungi proved to be exacting in its carbon requirements. The mycelium made good growth on d-glucose, d-mannose, trehalose, cellobiose, and some combinations of glucose with fructose and galactose; d-fructose, d-mannite, maltose, saccharose, raffinose, d-dextrin, glycogen, and mixtures of dextrins or starch with maltose were moderately satisfactory sources. Succinic, fumaric, and l-malic acids were assimilable. For the production of 1 mg. mycelium in media with 1 to 2 per cent. of a carbon source the average quantity of glucose utilized ranges from 1·3 to 1·9 mg. Growth was accompanied in all the cultures by a fall in the pH, induced by the utilization of ammonium ions.

The phosphorus and nitrogen contents of the mycelia depended on their age and on the nature of the carbon source, averaging 1·2 to 1·6 per cent. on a dry weight basis for the former element and 4·2 to 5·3 per cent. for the latter. Of the available nitrogen, 10 to 25 per cent. is returned by young cultures, particularly starch ones, to the substratum in the form of organic compounds.

MÄKITALO (R.). **The action of fungus extracts on yeast nucleic acid.** —*Ann. Med. exp. Fenn.*, 31, 4, pp. 348–360, 4 graphs, 1953. [Received September, 1954.]

In studies at the University of Helsinki, 73 per cent. of the 1:10 saline extracts of 130 Finnish fungi were shown by the Davidson–Waymouth acid precipitation technique to display ribonuclease activity, *Armillaria mellea* being particularly active.

DU PLESSIS (S. J.) & VAN DER LINDE (W. J.). **Inspection of seed Potatoes for Government certification.**—*Fmg in S. Afr.*, 29, 338, pp. 263–266, 268, 1954.

The regulations of October, 1951, governing the production of seed potatoes in South Africa are revised herein by the Department of Agriculture. The percentages of disease tolerated at the second land inspection are: certificate A (standard), leaf roll [virus] 2, mosaic and bolters 2, bacterial wilt (*Pseudomonas solanacearum*) nil, and *Phytophthora infestans* nil; choice A, 1, 1, nil, and nil; export A, 2, 2, nil, and nil; and commercial, ordinary, and export AA, 0·2, 0·2, nil, and nil, respectively. The percentages of *Fusarium* wilt (point rot) and *P. infestans* tolerated at tuber inspection are 3 and nil for all certificates except export A and AA, which require nil for both diseases. The percentages of common scab [*Actinomyces scabies*] allowed for these six certificates are 5, 5, nil, 10, 5, and nil, respectively. As regards *Rhizoctonia* or surface scab [*Corticium solani*] badly infected tubers must be removed and the remainder treated to gain standard and choice A certificates, also commercial and ordinary AA. Incidence must be nil for export A or AA.

Strasser (J.). **Ertragssteigerung durch Saatgutwechsel.** [Yield increase through change of seed.]—*Pflanzenschutz*, 6, 3, pp. 36–37, 1954.

The results of experiments in Bavaria in 1951 and 1952 showed that the yields of potato stands suffering from degeneration caused by viruses [*R.A.M.*, 33, pp. 172, 750] were increased by averages of 42 and 54 per cent., respectively, by the use of approved seed.

Rhenius (H.). **Abbaufragen und Standortwahl in Pflanzkartoffelanbau. (Untersuchungen am 'anerkannten' Nachbau der Bezirke Magdeburg und Halle.)** [Questions of degeneration and choice of sites in seed Potato cultivation. (Investigations on 'approved' selections in the districts of Magdeburg and Halle.)]—*Dtsch. Landw.*, 5, 5, pp. 234–238; 6, pp. 283–287, 1 map, 1954.

A full discussion is given of the relative merits of different areas in the Magdeburg and Halle districts of central Germany as sites for seed potato cultivation, with special reference to the avoidance of the ecological form of degeneration [*R.A.M.*, 29, p. 226]. This is believed to stimulate precocious activity by viruses which would otherwise remain latent in the plants for indefinite periods.

Wilamovitz (T. v.). **Zur Frage der negativen Auslese bei der Pflanzkartoffelgewinnung in der breiten Landwirtschaft.** [On the question of negative selection in seed Potato production in large-scale agriculture.]—*Dtsch. Landw.*, 5, 2, pp. 71–74, 1 fig., 1 graph, 1954.

Up-to-date information is presented on the effects of viroses on seed potato production in Germany [*R.A.M.*, 33, p. 373, and next abstract]. According to a 1939 estimate cited by Ross (*Kartoffelbau, 1953*, 4, 1953), the annual losses from this source range from 10 to 15 per cent. of the harvest or 4,000,000 to 6,000,000 tons, of which 60 per cent. is accredited to leaf roll virus, 20 per cent. to virus Y, 10 per cent. to viruses X and A, and the remainder to the aucuba, bouquet [*R.A.M.*, 33, p. 588], and potato stem-mottle viruses [loc. cit.].

The yield reductions consequent on virus infection are illustrated by some data from two localities in the Weimar area. For instance, in 1952 the average weights (in gm.) of 10 leaf-roll-diseased Flava, Johanna, Gemma, and Ackersegen plants were 320, 565, 490, and 683, respectively, compared with 680, 652, 750, and 1,166, respectively, for healthy ones. In 1953 the figures for diseased Ackersegen, Voran, Aquila, and Merkur were 680, 705, 637, and 895, respectively, and for healthy 1,170, 970, 1,042, and 1,395, respectively. In 1952 primary infection by virus Y reduced the weight of Ackersegen plants from 1,170 to 922 gm., followed in 1953 by a further drop to 179 as a result of secondary infection. Primary infection of Voran and Aquila was not observed in 1952, but in 1953 secondary infection caused reductions from 970 to 154 and from 1,042 to 170 gm., respectively. The average plant weights from 1951 to 1953 inclusive, of Erstling [Duke of York], Mittelfrühe, and Aquila infected by crinkle [X+Y] were 264, 170, and 417 gm., respectively, as against 1,085, 710, and 1,042 gm., respectively, for healthy samples.

Present methods of sorting tubers according to size are regarded as quite inadequate, and full directions are given for the stringent selection of plants before harvesting.

Müller (G.). **Ein Beitrag zur Frage der Resistenz auf Virusbefall und Ertrag bei 19 zugelassenen Kartoffelsorten.** [A contribution to the question of resistance to virus infection and of yield in 19 approved Potato varieties.]—*Dtsch. Landw.*, 5, 4, pp. 177–182; 5, pp. 228–234, 8 graphs, 1954.

A detailed account is given of experiments covering the period from the spring of 1950 to the autumn of 1953 at the Institute for Agriculture, Müncheberg, Mark,

Germany, to determine the resistance to virus infection [see preceding abstract] and the productivity of 19 approved potato varieties [*R.A.M.*, 33, p. 173]. The most susceptible were Erstling [Duke of York], Sieglinde, Frühmölle, Frühbote, Frühnudel, Mittelfrühe, Merkur, Ackersegen, and Voran, while the most resistant were Cornelia and Aquila, followed by Capella, Bona, and Leona. Intermediate in their reactions were Flava, Toni, Johanna, Immertreu, and Hilla, the last three inclining towards susceptibility.

MacLeod (D. J.). **Aster yellows (purple top) of Potatoes.**—*Amer. Potato J.*, 31, 5, pp. 119–128, 3 figs., 1954.

In this paper from the Department of Plant Pathology, Ottawa, the facts presented, principally from the literature (37 titles), indicate that purple-top disease is the common expression in the potato and other hosts of two or more viruses belonging to the aster yellows group [*R.A.M.*, 32, p. 67; cf. 33, p. 621]. A similar effect is also produced by injury to base of plant and roots by certain fungi, bacteria, and physical agencies. When purple top in the primary stage coincides with the maturing phase of the plant, the symptoms may resemble 'late leaf roll' which is rather like primary and apical leaf roll. The virus associated with the bunchtop phase of the disease in Canada attacks the weeds *Asclepias syriaca* and *Erigeron canadensis* and also red clover (*Trifolium pratense*). These infected hosts may possibly serve as reservoirs from which leafhoppers (*Macrosteles fascifrons*) could transmit the virus to potato plants, though no vector has been found for the virus in Canada. Though having aspects in common with the aster yellows virus, it differs from it in not causing sterility in the hosts attacked. It is readily transmitted by stem grafting to *Nicotiana tabacum* and *Datura stramonium* which are thought to be immune from the aster yellows virus.

Giddings (N. J.). **Some studies of curly top on Potatoes.**—*Phytopathology*, 44, 3, pp. 125–128, 1954.

At the Sugar Plant Investigations, Riverside, California, self-fertilized Earlaine potato seedlings have proved highly susceptible in the greenhouse to infection by strains 1, 3, 5, 6, 8, and 9 of beet curly top virus [*R.A.M.*, 33, p. 751], many infected plants producing no tubers. Until 1951 the results of inoculation tests on commercial potato varieties were negative or erratic, but strain 12 [33, p. 498] infects them readily. The virus moves slowly downwards into the tubers and into stems arising from the inoculated stem at a distance of up to 2 in. The potato is not considered to be a good host for the differentiation of beet curly top virus strains in general, but strain 12 is an exception in this respect.

Folsom (D.). **Practical control measures for leafroll.**—*Amer. Potato J.*, 29, 10, pp. 229–233, 1952.

The author briefly discusses the principal methods used to control potato leaf roll in the United States [*R.A.M.*, 31, pp. 201, 450; 32, pp. 67, 95, 445, and next abstract] under the headings seed testing, seed plots, foundation seed, seed certification, fertilizer selection, aphicides, herbicides, varietal resistance, and grading.

Natti (J. J.) & Ross (A. F.). **Branch-trace necrosis, a symptom of Potato leafroll virus infection.**—*Amer. Potato J.*, 31, 1, pp. 12–19, 1 fig., 1954.

Greenhouse tests carried out at Cornell University and New York Agricultural Experiment Station, Geneva, from March to the end of May, 1953, showed a more advanced form of phloem necrosis in potato plants naturally and artificially infected with leaf roll than that previously described as associated with this infec-

tion [*R.A.M.*, 33, p. 443]. Necrosis of the internal phloem of the branch traces at the nodes (visible to the unaided eye) in Katahdin and seedling Colorado 6332 proved to be as effective as the phloroglucinol test for diagnosing leaf roll, but under field conditions the test was less effective. This method of diagnosis cannot be considered to be of practical value until the reaction of different varieties of potatoes under field conditions is determined.

Witsch (H. v.) & Pommer (J.). **Tagesgänge der Assimilation gesunder und blattrollkranker Kartoffelpflanzen.** [Daily trends of assimilation in healthy and leaf-roll-diseased Potato plants.]—*Biol. Zbl.*, 73, 1–2, pp. 1–11, 7 graphs, 1954.

At the Botanical Institute, Weihenstephan, Bavaria, using an ultra-red absorption recorder, the authors determined the daily assimilation gradients of healthy potato plants and those with leaf roll virus in field plots under various environmental conditions during July and August, 1952. The process reached a maximum at temperatures of 18° to 20° C., with a plentiful water supply, high relative humidity, and illumination intensities of 40,000 to 60,000 lux. Healthy and infected potatoes reacted to a change of the external factors in the same way but in different degrees, usually involving an appreciable reduction of assimilatory efficiency in the diseased plants. Assimilation by healthy plants, at any rate in the early stages, was more severely inhibited by drastic water shortage than that of infected ones. The light optimum was lower for diseased than for healthy plants and with an inadequate than with a sufficient water supply. It would appear from a study of the assimilation curves that the course of the process in leaf roll plants is impeded by congestion in the plastids and obstruction of gas exchange through contraction of the stomata [cf. *R.A.M.*, 17, p. 547].

MacLachlan (D. S.), Larson (R. H.), & Walker (J. C.). **Interveinal mosaic of Potato.**—*Amer. Potato J.*, 31, 4, pp. 101–105, 2 figs., 1954.

In a co-operative series of experiments at the Department of Plant Pathology, University of Wisconsin, an attempt was made to transmit interveinal mosaic virus [? strain of potato virus X: *R.A.M.*, 10, p. 746; 14, p. 605] to a number of hosts by inoculation of expressed sap and by *Myzus persicae*. The potato varieties Irish Cobbler, Green Mountain, British Queen, and seedling 41956 were readily infected. *Nicandra physaloides* proved to be a masked carrier. *Datura ferox* and *D. tatula* developed symptoms on grafting. At 24° C. symptoms were masked in potato, but at 18° plants were stunted and exhibited marked interveinal chlorosis with slight rugosity of leaves. The systemic infection of both Irish Cobbler and British Queen and the failure to cross protect against virus A, indicate that interveinal mosaic virus is not a strain of virus A. The problem of interrelation with other potato viruses is being investigated.

Bradley (R. H. E.). **A rapid method of testing plants in the field for Potato virus X.**—*Amer. Potato J.*, 29, 12, pp. 289–291, 1 fig., 1953.

A simple, rapid, serological method of testing potato plants in the field for the presence of virus X is described [*R.A.M.*, 33, p. 620]. A clothes-peg inserted under a rubber band about one inch wide tacked over the top end of a wooden stake holds a glass slide. The stake is inserted in the ground beside the plant to be tested. Drops of sap expressed from leaflets on to the glass slide are tested, one with diluted antiserum and the other with normal serum or physiological salt solution [loc. cit.]. If consecutive plants are tested, four persons working as a team can test over 125 plants an hour. About ten stakes are needed.

De Montgremier (Hélène A.), Grabar (P.), & Croissant (Odile). **Action des ultrasons sur des suspensions de virus X de la Pomme de Terre.** [Action of ultrasound on suspensions of Potato virus X.]—*C. R. Acad. Sci., Paris*, 238, 6, pp. 722–724, 1 graph, 1954.

Particles of potato virus X exposed to the action of ultrasonic frequencies (800 kHz, 900 m A) disintegrated into fragments measuring 333, 266, 222, 199, 155, 133, 111, 66, and 33 mμ. Similar treatment of two samples of an identical suspension, one in air and the other in an atmosphere of hydrogen supplemented by ether, resulted after 30 seconds' exposure in a notable increase of infectivity (assayed on *Gomphrena globosa* leaves) in the latter (248 as compared with 84 per cent.). When the intensity of the vibration was reduced to 600 m A the virulence of the hydrogen-ether-treated sample was increased by two successive augmentations for the four minutes of treatment to 125 and 140 per cent. respectively, compared with only one slight rise (to 109 per cent.) after two minutes.

Hirst (J. M.). **A method for recording the formation and persistence of water deposits on plant shoots.**—*Quart. J.R. met. Soc.*, 80, 344, pp. 227–231, 1 fig., 1 diag., 1 graph, 1954.

From Rothamsted Experimental Station the author describes the principles, construction, and application of an apparatus designed to record the amount of water deposited on plant shoots by rain, dew, and guttation, and the length of time during which the surfaces remain wet, factors of great importance in determining the severity of such diseases as potato blight (*Phytophthora infestans*).

The water on a cut potato shoot, with the cut end sealed into a water-filled chamber placed on a balance, can be weighed by recording on a rotating drum the changes in equilibrium of the beam. The persistence of rain deposits depends on the weather. On 29th July, 1953, for instance, the leaves remained wet all night following rain between 6 and 8 p.m. In contrast, dew is deposited slowly over a long period and dries more rapidly. The heaviest deposit recorded was $6{\cdot}9 \times 10^{-3}$ gm. cm.$^{-2}$ as against $9{\cdot}6 \times 10^{-3}$ gm. cm.$^{-2}$ for the quantity of water retained during rain. Estimates of the mean weight of water over the total surface area of the shoot obscure the divergences of distribution and persistence of water deposits at various levels on different plant parts. Such differences, however, are probably very important in plant pathology; for example, the prevalence of lesions at the tips of leaflets is often associated with persistent water droplets. They are more common following rain than after dew, which rarely approaches run-off under English conditions.

Black (W.). **Late blight resistance work in Scotland.**—*Amer. Potato J.*, 31, 4, pp. 93–100, 1954.

In this paper presented at the Symposium on potato late blight (*Phytophthora infestans*) held at Madison, Wisconsin, on 7th September, 1953, the author reviewed recent work in producing resistant types [*R.A.M.*, 33, p. 250] and stated that 14 of the 16 possible genotypes have proved susceptible. Only two genotypes, $R_1R_2R_3$ and $R_1R_2R_3R_4$ [see next abstract], have not been attacked in the experiments carried out at the Scottish Plant Breeding Station.

Howatt (J. L.) & Hodgson (W. A.). **Testing for late blight resistance in the Potato in Canada.**—*Amer. Potato J.*, 31, 5, pp. 129–140, 1954.

The authors briefly review the work of the Canadian potato breeding project and testing for resistance to *Phytophthora infestans* [*R.A.M.*, 32, p. 665] conducted at Fredericton, New Brunswick, during the past 20 years, mainly reporting on the testing of *S. demissum* × potato hybrids. Several hundred plants were tested in

1952 and it was found that various cultures of the fungus reacted erratically at different periods, and that seedlings found by other workers to be similar genetically reacted differently to the isolates. Aquila failed to become infected by any of the isolates. Keswick and Canso became progressively less susceptible. Of 8,301 seedlings tested with the common strain of the fungus in the autumn of 1952, 33·6 per cent. proved resistant, but when exposed to a new form of blight from a field of the Keswick variety, all proved susceptible. This new form is suspected to have developed from a few stored diseased Keswick tubers. Only two of the English differentials (1488b(1) and 120/43) proved resistant through all the tests of five isolates of *P. infestans*, the inocula always being derived from Green Mountain leaves. There was a disparity in the results over a period of time. Keswick, Canso, and Aquila reacted negatively to all isolates except the Keswick culture. In the spring of 1953 some of Mills's differential hosts [33, p. 315] were tested with these five cultures, and these also gave conflicting results. The Keswick culture proved lethal to all genotypes. This might be the form postulated to be capable of attacking the host bearing the resistant genes $R_1R_2R_3R_4$ [see preceding abstract], but it failed to cause blight in *S. demissum*, though it was destructive to the foliage of *S. bulbocastanum* var. *glabrum*, two plants of *S. bulbocastanum* (numbered 22815) from Wisconsin remaining unaffected by this form. It would appear that at least a fifth gene is active in imparting blight resistance. On the basis of this evidence, schemes proposed for classification of races of *P. infestans* on certain potato genotypes seem inadequate to separate all known forms of the fungus. Standard testing conditions must be defined and maintained. The potential value of species other than *S. demissum* in breeding for blight resistance could be explored.

Estrada Ramos (N.). **Mejoramento genético de la Papa en Colombia, para resistencia a la 'gota' causada por el Phytophthora infestans (Mont.) De Bary.** [Genetic improvement of the Potato in Colombia through resistance to 'blight' caused by *Phytophthora infestans* (Mont.) De Bary.]—*Rev. Fac. Agron. Medellín*, 15, 45, pp. 5–130, 26 figs., 10 diags., 1954.

Most of the contributions to the literature on breeding for resistance to potato blight (*Phytophthora infestans*) [see preceding abstracts] listed in the five-page bibliography appended to this study have been noticed from time to time in this *Review*. Full details are given of the programme in Colombia for the development of resistance [*R.A.M.*, 28, p. 415; 31, p. 254], based on the combination of *Solanum demissum* lines with indigenous cultivated varieties of the *S. andigenum* type adapted to altitudes exceeding 2,000 m. and short days, which are the prevailing environmental conditions in the Andes. Results obtained up to the present indicate the possibility of obtaining suitable material within three or four generations by means of back-crossing. Resistant foreign selections and varieties may also be incorporated in the programme once their resistance to the native physiologic races of the pathogen has been established.

Terman (G. L.), Cunningham (C. E.), & Goven (M.). **Effect of date and method of kill on yield, specific gravity and other quality factors of Maine Potatoes.**—*Amer. Potato J.*, 29, 12, pp. 279–289, 1953.

In an experiment carried out at Presque Isle, Maine, in 1951, the tops of different lots of Chippewa, Green Mountain, Katahdin, and Kennebec potato plants were destroyed on 14th or 24th August or 3rd September by (*a*) cutting, (*b*) rapid and (*c*) slower chemical killing with two applications of an arsenical at a five-day interval; dinitro spray (sinox) was used on the stubs left after cutting. Sinox killed the leaves in two to three days, and the arsenical in three to five; the stems remained green a few days longer, but the kill was fairly complete ten days after the first treatment or at the first harvest.

Yields increased as long as any portion of the vines remained alive, the averages for Chippewa following the three methods being (*a*) 545, (*b*) 588, and (*c*) 553 bush. per acre, while the corresponding figures for Kennebec were 506, 505, and 539; for Katahdin 429, 436, and 461; and for Green Mountain 445, 482, and 486 bush. per acre. The slower methods of kill also gave potatoes with a higher specific gravity. On the whole, the most rapid kill resulted in the least amount of shallow skinning or skin-breaking. Susceptibility of the tubers to mechanical injury increased markedly with decrease in temperature during harvesting.

Hingorani (M. K.) & Addy (S. K.). **Factors influencing bacterial soft rot of Potatoes.**—*Indian Phytopath.*, 6 (*1953*), 2, pp. 110–115, 1954.

Studies on tuber rot of potatoes, using cultures of *Erwinia carotovora*, *E. aroideae* [strain of *E. carotovora*], *E. atroseptica* [cf. *R.A.M.*, 33, p. 73], and *Bacillus mesentericus*, were conducted at the Division of Mycology and Plant Pathology, Indian Agricultural Research Institute, New Delhi. Presoaking in water, storage under reduced oxygen tension, exposure to extremes of temperature [cf. 33, p. 558], and solar irradiation predisposed tubers to rot attack. Immature tubers were more susceptible than mature ones. *E. carotovora* and *E. atroseptica* were more destructive at low temperatures and *E. aroideae* and *B. mesentericus* at high ones. *E. aroideae* did not produce decay at 4° C. even when the relative humidity was 100 per cent. None of the organisms caused rotting at 4° at relative humidities up to 35 per cent.

Newbould (F. H. S.) & Garrard (E. H.). **Studies on actinophage for Streptomyces scabies (Thaxt.) Waksman and Henrici.**—*Canad. J. Bot.*, 32, 3, pp. 386–391, 1954.

An account of preliminary work at Ontario Agricultural College, Guelph, on the isolation and characteristics of an actinophage specific for strains of *Streptomyces* [*Actinomyces*] *scabies* pathogenic to potato [see next abstract; *R.A.M.*, 33, p. 623] has already been noticed [32, p. 693]. Tested against actinomycete cultures isolated directly from soil, the phage was less specific and failed to differentiate pathogenic forms. This is attributed to variation among the soil actinomycetes.

Douglas (R. J.) & Garrard (E. H.). **Serological observations on the actinomycetes associated with Potato scab.**—*Canad. J. Bot.*, 32, 3, pp. 480–485, 1954.

Most of this information from Ontario Agricultural College, Guelph, on the serological behaviour of strains of *Streptomyces* [*Actinomyces*] *scabies* isolated from potato [see preceding abstract] has already been noticed from an abstract [*R.A.M.*, 32, p. 693].

Gorter (G. J. M. A.). **Target spot in Potatoes.**—*Fmg in S. Afr.*, 29, 338, pp. 261–262, 2 figs., 1954.

Early blight of potato (*Alternaria solani*) often causes considerable damage on the Transvaal Highveld [*R.A.M.*, 28, p. 210] once the plants have come into flower. Control is effected over large areas by regular spraying with 4–6–50 Bordeaux mixture five to seven times in all at ten- to 12-day intervals from the time the plants are about 6 in. high, using a motor sprayer delivering 2 gals. per minute at a pressure of 400 lb. per sq. in. For small fields, dusting from a knapsack duster is preferable, the amount of dust required varying from 25 to 50 lb. per morgen [1 morgen = 2·17 acres] according to the size of the plants.

Fuchs (W. H.). **Einige Beobachtungen über die Pickelbildung (Tüpfelfleckigkeit) der Kartoffel.** [Some observations on pimple formation (pit spotting) in the

Potato.]—*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), *Stuttgart*, 6, 5, pp. 75–76, 2 figs., 1954.

At the Institute for Plant Pathology of Göttingen University *Oospora pustulans* [C.M.I. map No. 202] was isolated on potato water-glucose agar, sterilized carrot slices, and sterilized steamed potato slices from pustules on seed potatoes, this being the first definite record of its occurrence in Germany. The mycelium grew slowly at 12° and 16° C. but not at all at 20°. Inoculation experiments gave positive results only on tubers needle-punctured and stored at 8° or 16° under conditions of high or moderate atmospheric humidity.

Hofferbert (W.) & Zu Putlitz (G.). **Unsere Arbeiten zur Rhizoctonia-Frage bei der Kartoffel. Pflanzzeit und Rhizoctonia-Befall.** [Our studies on the problem of *Rhizoctonia* in the Potato. Planting time and *Rhizoctonia* infection.]—*Z. PflKrankh.*, 61, 6, pp. 293–301, 4 graphs, 1954. [English summary.]

Further studies on the *Rhizoctonia* disease of potatoes [*Corticium solani*] in Western Germany [*R.A.M.*, 33, p. 500] were concerned with planting time and soil type in relation to infection. Tubers of the Vera, Augusta, Bona, Heida, and Ackersegen varieties were planted on 16 dates between 25th March and 16th June, 1953, in light, dry, and warm soil with good humus content at Ebstorf and in cold, heavy ground, difficult to till, at Stadorf. At Ebstorf the incidence of infection was lowest in stands of the second and third plantings (1st and 7th April) and at Stadorf in those of the sixth to eighth (22nd and 27th April and 2nd May). The observations lent no support to the prevailing opinion that warmth and dryness of the soil favour the host at the expense of the fungus. On the contrary, the disease assumes a particularly aggressive character under such conditions, causing heavy reductions in yield and quality in stands attacked during the susceptible early stage of growth. Medium temperatures (minimum of 5° to 10° C.) and sufficient moisture are considered to provide the best environment for a healthy crop.

Ayers (G. W.). **Studies on Verticillium wilt of Potatoes.**—*Amer. Potato J.*, 29, 9, pp. 201–205, 1952.

Some of the conclusions from trials herein described, carried out from 1949 to 1951 at the Charlottetown Laboratory, Prince Edward Island, on varietal resistance in potatoes to *Verticillium albo-atrum* [*R.A.M.*, 32, p. 665] have already been reported. Among susceptible varieties no direct correlation was established between the amount of disease when the plants were exposed to soil-borne inoculum and the extent to which the fungus was carried in the tubers. Economic losses in commercial stands in Prince Edward Island are confined almost entirely to susceptible varieties carrying mycelium in the tubers.

Experimental evidence obtained in 1948 and 1949 indicated that treatment of tubers from wilted plants with an organic mercurial effectively reduced the incidence of wilt. Seedling F 4328 was highly resistant.

Ellison (J. H.) & Jacob (W. C.). **Internal browning of Potatoes as affected by date of planting and storage.**—*Amer. Potato J.*, 29, 10, pp. 241–252, 5 graphs, 1952.

A survey of potato fields in Long Island in 1948 demonstrated that many lots of Green Mountain potatoes would not pass U.S. No. 1 grade test because of high incidence of internal brown spot [*R.A.M.*, 33, p. 558]. The hills with green tops had much more brown spot than those with dead tops.

Experimental results in 1948 and 1949 were as follows. Potatoes planted in May had significantly more brown spot than those planted in April or June, and very much more than those planted in July. Green Mountain had very highly

significantly more brown spot than Katahdin, and was much more affected by cultural practices, time of harvest, and storage. Thus, when planted in May under irrigation, brown spot decreased notably in the tubers as they lay in the ground for approximately four weeks after the tops had matured, whereas without irrigation brown spot increased sharply. Tubers planted in April, June, and July were less affected by irrigation and time of harvest. In general, irrigation and storage tended to reduce the disorder, but these effects were much influenced by date of planting and the practice of haulm killing. In autumn irrigated potatoes gave no response to killing except for the increase in brown spot in the June-planted. More browning was present in Green Mountain from the first harvest than from the second or third, but after storage there was no difference between those harvested at different dates. The general level of browning in Green Mountain decreased significantly during storage, whereas in Katahdin there was little change. The decline was steep in potatoes planted in April and early May, but was insignificant in those planted in late May and June. Potatoes harvested about four weeks after maturity had more brown spot than those harvested soon after, but at the end of the storage period the late harvested tubers had slightly less brown spot than the others.

Baba (I.), Takahashi (Y.), & Iwata (I.). **Studies on the nutrition of Rice plant with reference to Helminthosporium leaf spot (preliminary report). VIII. Varietal differences of the Rice plant in the growth retardation and in the increase of disease susceptibility caused by hydrogen sulphide.**—*Proc. Crop Sci. Soc. Japan*, 23, 1, pp. 10–15, 1 fig., 5 graphs, 1954. [Japanese, with English summary.]

At the National Institute of Agricultural Sciences, Japan, further experiments on the effects of various nutrients on the susceptibility of five varieties of rice to *Helminthosporium* [*Ophiobolus miyabeanus*: *R.A.M.*, 33, p. 378] demonstrated that the addition of hydrogen sulphide to the nutrient solution induced a root rot in all varieties, decreased yield, and increased susceptibility. Norin 37 was less susceptible to root rot than the other varieties. Varietal reaction was more clearly marked after the hydrogen sulphide treatment.

South American leaf blight.—*Plant. Bull. Rubb. Res. Inst. Malaya*, N.S. 3, pp. 54–56, 1 fig., 1952.

Most of this information on leaf blight disease (*Dothidella ulei*) of rubber and the precautions taken to prevent its introduction into Malaya has already been noticed [*R.A.M.*, 32, p. 588].

Remarkable malady in young budded Rubber.—*Plant. Bull. Rubb. Res. Inst. Malaya*, N.S. 3, pp. 62–64, 4 figs., 1952.

An unusual type of malformation was observed in two fields of two-year-old rubber buddings of clone R.R.I. 501 in central Perak, Malaya, in 1952. The trunks had developed a distortion, ranging from a barely discernible bend (always near a concentration of leaf scars) to two or three sharp bends, or even a complete loop, but were otherwise normal and healthy throughout, though the distortion seemed to be associated with a retardation of growth. The cause is unknown. The remedy tentatively suggested is to cut the grosser malformations right back and the others just below the abnormal position, and to leave the less severely affected trees as they are.

Van Emden (J. H.). **Replanting and control of powdery mildew.**—*Quart. Circ. Rubb. Res. Inst. Ceylon*, 29 (*1953*), 3–4, pp. 42–52, 2 graphs, 1954.

In this paper, read at the Rubber Conference held in Ceylon in November, 1953, the author states that the answers to a questionnaire concerning the incidence of

Oidium [*heveae*: *R.A.M.*, 33, p. 253] on all rubber estates in Ceylon where sulphur dusting was carried out showed that during 1952–3 about one-half of the plantings of Tj.1, BD.5, old seedling rubber, and PBIG seedlings suffered damage as a result of infection, even though 1953 was a year of light attack. The position in respect of Tj.16 and PB.25 was slightly better, but GL.1, MK.3/2, PIL.B.84, and PB.86 had, respectively, only 17, 17, 14·5, and 4 per cent. fields with medium to heavy infection. Thus, the difference in susceptibility of planting material is considerable. Clones HC.28 and PR.107, on which not enough data were available, should be given a trial, as there are indications that they are reasonably resistant. Growers who contemplate replanting with clonal seedlings are advised to watch developments in the next two years and prepare for crown budding with LCB.870 [loc. cit.]. The most effective sulphur tested at the Research Institute was found to consist of particles 20 to 40 μ in diameter. High-volume spraying (100 gals. per acre, or more) is not considered practicable in Ceylon, owing mainly to the waste of liquid involved; low-volume machines with small engines (about 5 h.p.) might, however, be used if the trees were planted according to the hedge system. If a planting distance of 5×50 ft. is assumed, a small mistblower, such as the micron sprayer [33, p. 254] travelling at 2 m.p.h., could treat 2,000 trees per hour of actual spraying, which corresponds to approximately 10 acres per hour. Hedge-planting decreases the cost of controlling *O. heveae* and *Fomes* [*lignosus*: see next abstract].

Newsam (A.). **Fomes lignosus in replanted areas.**—*Quart. Circ. Rubb. Res. Inst. Ceylon*, 29 (*1953*), 3–4, pp. 78–84, 1 graph, 1954.

In this paper, read at the Rubber Conference in Ceylon on 16th November, 1953, the author states that experimental evidence obtained in Malaya does not support the view that *Fomes lignosus* [*R.A.M.*, 33, p. 560] remains dormant on old rubber trees. Severed, and therefore moribund, roots are more quickly invaded than healthy ones, but no difference was established between the susceptibility of young and somewhat older trees. Further, diseased patches due to *F. lignosus* in the oldest rubber are known to extend. Trees of all ages are susceptible, and the time required to kill a tree is probably mainly a function of the size of its root system.

In any replanting even the roots of healthy trees are a potential danger, since they may later become infected. Total eradication of the old stand supplies the ideal solution of the problem, though the more practicable method is to eradicate only the actively diseased trees. The costs of clearing old rubber by mechanical means, by hand-jacking, by felling and clearing, by stump poisoning, and tree poisoning are estimated, respectively, at 250, 250, 125, 10, and 10 Malayan dollars or 400, 400, 200, 15, and 15 Ceylon rupees per acre [cf. 33, p. 257].

Experiments have demonstrated an incidence of root disease on young rubber where bush or creeping covers are planted of only half that in comparable clean clearings. Bush covers, however, must be eradicated when infected, and they are not as effective as creepers in hastening the decay of surface timber.

Alexander (F. E. S.) & Jackson (R. M.). **Examination of soil micro-organisms in their natural environment.**—*Nature, Lond.*, 174, 4433, pp. 750–751, 1 fig., 1954.

For a method of examining soil fungi in their natural environment, devised at the Faculty of Agriculture, University College, Ibadan, Nigeria, small soil samples are collected in a polyethylene tube fitted with a detachable metal shoe (so that they can be kept in the tube throughout the operations), dried rapidly under vacuum, and vacuum-impregnated with a 'Marco Resin' mixture at a low temperature by a drip method. Once the resin has matured the sample is hard enough to be cut without disturbance into slices 1 mm. thick. These are removed at 140 r.p.m. for a 10-in. disk using 100-grade carborundum, rubbed down to the desired

thickness, polished with carborundum and water, and mounted and covered with pure Canada balsam.

Sections of sandy loam and sandy clay loam prepared in this manner have a moderate to high degree of translucency even at thicknesses of several hundred μ. Algae, fungus hyphae, and fructifications are clearly visible in the soil pores and on the surfaces of the mineral particles. Preliminary trials suggest that staining the soil sample (by capillarity) before impregnation may enhance the value of the method when fine hyaline mycelia and bacteria are being studied.

Pathak (A. N.). **Activity of micro-organisms affecting nitrogen, phosphorus and carbon changes in soil.**—*Agra Univ. J. Res.* (*Sci.*), 3, 1, pp. 217–232, 1954.

At Agra University, India, it was found that the addition of nitrogen, phosphorus, or carbon (filter paper) compounds to the soil increased considerably the numbers of fungi, actinomycetes, and bacteria, with a corresponding increase in carbon dioxide evolution. Maximum numbers were reached from the second to fourth weeks after the addition of the nutrient.

Stapp (C.) & Spicher (G.). **Untersuchungen über Aktinomyzeten des Bodens. II. Mitteilung.** [Studies on the actinomycetes of the soil. Note II.]—*Zbl. Bakt.*, Abt. 2; 108, 1–3, pp. 19–34, 1 fig., 17 graphs, 1954.

In general, uric acid and the substances from which it is derived, namely, xanthine, hypoxanthine, and adenine, as well as urea, at concentrations ranging from 0·05 to 0·1 per cent. were effectively utilized as sources of nitrogen by 60 strains of *Streptomyces* isolated from the soil and maintained in pure culture on a synthetic nutrient agar at the Brunswick branch of the German Biological Institute [*R.A.M.*, 32, p. 590], but compounds like uracil, pyridine, imidazole, and pyrrole were not assimilated. Soil extract added to the medium accelerated the growth of some strains and retarded that of others: in no case did it serve as a substitute for carbon or nitrogen.

Harder (R.). **Über die arktische Vegetation niederer Phycomyceten.** [On the Arctic vegetation of lower Phycomycetes.]—*Nachr. Akad. Wiss. Göttingen*, IIb, *1954*, 1, pp. 1–9, 1954.

The results of analyses at the Academy of Sciences, Göttingen, Germany, of 68 soil samples from Swedish Lapland (north of the Arctic circle) and six from Spitzbergen for their content of lower phycomycetes [cf. *R.A.M.*, 29, p. 119] are described and tabulated. The alpine region of Lapland yielded only four species, *Olpidium pendulum*, *Rhizophydium* sp., *Karlingia rosea*, and *Nowakowskiella elegans*, the birch forest region six (*R. sphaerotheca* and *Chytridium* sp. in addition to the foregoing), and Spitzbergen only two, *O. pendulum* and *N. elegans*. On the other hand, cultivated soils of the same localities in Lapland contained 17 species, including, *inter alia*, besides those already mentioned, *Rozella irregularis*, *Rhizophydium* spp., *Phlyctochytrium synchytrii*, and *Olpidiopsis gracile*. Other phycomycetes (mostly Mucorales and *Pythium* spp.), which were present in practically every sample examined, are not enumerated separately.

Bewley (W. F.). **Steam sterilization of glasshouse soils.**—*Rep. Int. hort. Congr.*, 13 (*1952*), pp. 789–793, 1953. [French summary.]

The most important use for steam sterilization of soil is in tomato glasshouses [*R.A.M.*, 32, p. 607]. Steam is generated in 20 to 30 h.p. loco-type boilers, producing 1,650 to 3,000 lb. of steam per hour, which passes out of perforated pipes buried 12 to 15 in. in the soil, at a pressure of 90 lb. Steam is passed for a further ten minutes after the temperature of the soil reaches boiling-point. After steaming the soil is flooded and then fertilizer applied.

Hewitt (E. J.). **The importance of molybdenum in the nutrition of horticultural plants.**—*Rep. Int. hort. Congr.*, 13 (*1952*), pp. 375–385, 2 graphs, 2 pl., 1953. [French summary.]

This is a general paper briefly summarizing work done at Long Ashton Research Station, Bristol, since 1947, on the importance of molybdenum as a micronutrient, particularly with reference to brassica crops and lettuce. Much of this work has been noticed in the *Review* [*R.A.M.*, 30, p. 255; 31, p. 466; 33, p. 156].

Horner (C. E.). **Pathogenicity of Verticillium isolates to Peppermint.**—*Phytopathology*, 44, 5, pp. 239–242, 1 fig., 1954.

At Oregon State College, Corvallis, 17 isolates of *Verticillium albo-atrum* from 11 hosts were able to infect peppermint [*R.A.M.*, 33, p. 688]. They were consistently separable into three groups by differences in symptomatology, host range, and relative growth in peppermint stems, viz., I, isolated from peppermint with symptoms (four strains), II, isolated from symptomless peppermint (three), and III, strains from each of the following: *Symphoricarpos albus*, *Acer rubrum*, tomato, *Malva rotundifolia*, White Rose potato, Washington raspberry, *Arctium minus*, *Cirsium arvense*, *Chenopodium album*, and peony (*Paeonia albiflora*). One Oregon isolate (A–1) from wilted peppermint proved to be pathogenic to *A. minus*, *C. album*, *Cirsium arvense*, *M. rotundifolia*, *Amaranthus retroflexus*, peppermint, and tomato, and invaded the stems of all except *Arctium minus* and *M. rotundifolia*. A strain from Indiana (B–11–B) attacked the roots and stems of *C. arvense*, peppermint, and tomato, and the roots only of *Chenopodium album*.

The peppermint isolates grew much more rapidly in peppermint stems (introduced from wounds or from infested soil) than did isolates from the other hosts. Group I isolates were the most rapid growers and caused typical wilt symptoms. Group II isolates caused only slight yellowing of the lower leaves or no symptoms. Group III isolates produced no visible symptoms in peppermint.

Nutman (F. J.) & Roberts (F[lorence] M.). **Valsa eugeniae in relation to the sudden-death disease of the Clove tree (Eugenia aromatica).**—*Ann. appl. Biol.*, 41, 1, pp. 23–44, 2 pl. (1 col.), 6 figs., 1954.

After recapitulating the symptoms of sudden death of clove trees (*Valsa eugeniae*) [*R.A.M.*, 29, p. 277; 33, p. 411, *et passim*] in Zanzibar, the authors state that a disturbing feature of the clove industry to-day is the steady increase in the 'slow decline' form of the disease in young saplings [loc. cit.]. *V. eugeniae* is the only fungus consistently associated with this decline. Inoculations of clove seedlings up to one year old and of potted seedlings four to five years of age with *V. eugeniae* by various methods all gave negative results [32, p. 65], and this immunity was confirmed by field evidence.

When holes were made round the main trunks of 24 nine-year-old saplings and they were flooded with a spore suspension of *V. eugeniae*, relatively large quantities of the liquid being absorbed, discoloration indicating that invasion was taking place resulted, but the holes healed up. When branches on six nine-year-old saplings were twisted until longitudinal cracks developed in the bark or bent until the bark on the convex side fractured, and then inoculated with a suspension of the fungus, eight branches were dead 11 months later and 13 were infected but not yet dead.

Inoculations through holes drilled in trees did not seem to reproduce the way in which the disease arises in nature. Consequently, the entire surface root systems of eight mature trees were exposed by hand, the soil being replaced by a heavy mulch of clove leaves, which was kept well watered. A profuse development of absorbing roots occurred. Meantime, small billets cut from trees killed by sudden death were stacked at the site, covered with coco-nut fronds, and kept damp. Abundant fructification of *V. eugeniae* resulted, and the billets were then placed

on the surface of the leaf mould, covered, kept wet, and renewed periodically. Fourteen months later the fibrous roots were dead over large areas.

The view that *V. eugeniae* might be ubiquitous, invading most if not all dead clove trees, cannot be maintained, because, apart from its rôle as a cause of die-back, in which it obviously acts as a primary pathogen, it is found only in clove trees which have died from sudden death or slow decline. It has not been found on any tree but clove. In view of the observed facts, it appears to be highly probable that sudden death begins in the root system and is caused by destruction of the roots by *V. eugeniae*.

Though *V. eugeniae* as a cause of die-back is of minor economic importance compared with *Cryptosporella eugeniae* [33, p. 411], its contribution to this aspect of the disease may be of much pathological significance, as it occurs in areas as yet unaffected by sudden death. When die-back trees become girdled and die the fungus spreads and fructifies all over the surface, producing inoculum equivalent to that from a tree killed by sudden death. After rain, enormous quantities of ascospores and pycnidiospores are released and may easily be washed into the soil and come into contact with the roots. In its most typical and rapidly spreading form the disease always occurs in groves of mature trees, in which the canopy is unbroken and where the ground is covered with leaf litter. Die-back should be controlled, if only because of its importance in relation to sudden death. There is no evidence that spread takes place by root contact.

Though the terms 'sudden death' and 'slow decline' are used to describe two different conditions, there is a complete gradation between the two; slow decline is caused by *V. eugeniae* attacking the roots of trees which still retain juvenile resistance to the fungus. Many of the young trees planted in sudden death areas are unlikely to reach maturity, but new plantings will probably succeed if all dead and dying trees and their roots are removed and the area given up to some other crop for a few years before replanting.

LAUDEN (L.). **Seed treatment for stunting disease in 1954.**—*Sug. Bull., N. Orleans*, 32, 20, pp. 308, 317, 1954.

Again in 1954 the American Sugar Cane League, the Louisiana State Experiment Station, and the United States Department of Agriculture are to continue their joint experiments on the control of sugar-cane ratoon stunting by treatment of seed setts with hot air for eight hours at 54° C. [*R.A.M.*, 33, p. 320]. Full particulars are given of the specifications for the various components of the heating unit, to accommodate $3\frac{1}{2}$ tons of setts.

LUC (M.). **Leptosphaeria sacchari v. Breda de Haan. Maladie des taches rondes de la Canne à Sucre.** [*Leptosphaeria sacchari* v. Breda de Haan. Ring spot disease of Sugar-Cane.]—*Rev. Mycol.*, 18, *Suppl. colon.* 2, Fiche 10, 4 pp., 5 figs., 1953. [Received September, 1954.]

This brief account of ring spot of sugar-cane (*Leptosphaeria sacchari*) [*R.A.M.*, 33, p. 758] includes notes on geographical distribution, hosts, symptoms, causal organism, parasitism, and control.

RITCHIE (D.). **A fungus flora of the sea.**—*Science*, 120, 3119, pp. 578–579, 1 fig., 1954.

After referring to the possibility that marine fungi [cf. *R.A.M.*, 31, p. 301] may prove to be of great economic importance, the author lists the genera represented by the isolates obtained by him from submerged wood and marine organisms in Limon Bay, at the Atlantic end of the Panama Canal, and in Panama Bay at the Pacific end. These fungi are at present in culture at the Naval Research Laboratory, Washington, D.C.

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